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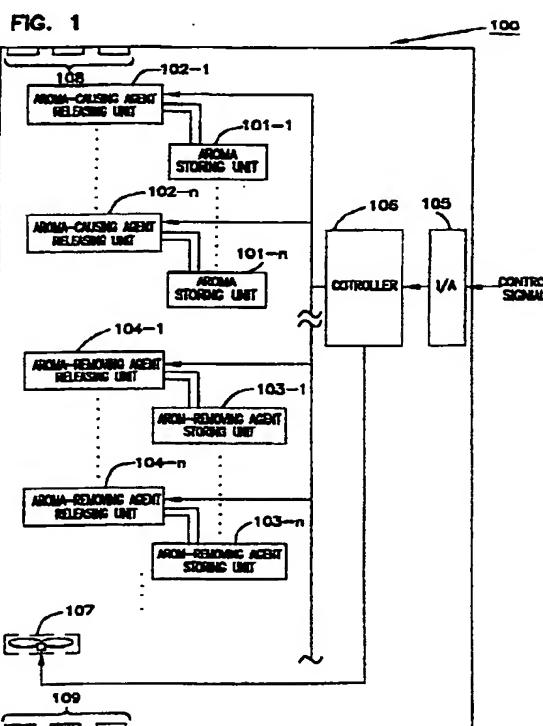
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### (54) Methods and systems for controlling olfactory stimuli

(57) The system and method of controlling the olfactory stimuli releases an aroma and stores information on the released aroma so that the released aroma is substantially eliminated based upon the stored information prior to an additional release of a new aroma. The system and method of controlling the olfactory stimuli also measures certain predetermined environmental conditions and generates an odor based upon the measured environmental conditions and predetermined-base lines.



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**Description****Field of the Invention**

The current invention is generally related to methods and systems for controlling olfactory stimuli, and more particularly related to the methods and the system for controlling the olfactory stimuli based upon predetermined environmental conditions.

**BACKGROUND OF THE INVENTION**

Olfactory stimuli often elicit certain responses in humans. For example, certain olfactory stimuli generally make us feel refreshed while others make us feel nauseated. Yet other olfactory stimuli increase our appetite. In other words, olfactory stimuli have a wide variety of roles and effects in our daily lives. Such a variety of effects is reflected in languages such as in Japanese in which three different characters respectively express "aroma," "desirable scent" and "undesirable odor." However, despite the wide variety of scents that humans perceive, according to one theory, there are only 20 to 30 original scents, and the wide variety is generated by the combinations of these original scents.

To control the variety of undesirable odor, various products have been available. For example, deodorants and perfumes overpower body odors while air refreshers control undesirable odors. These products generally suppresses an existing odor by an overwhelming additional odor. In contrast to the above described suppression, certain other products such as bathroom products neutralize an existing undesirable odor. For example, a certain solid product is sublimated for reacting with an odor-causing agent such as ammonia in the air so as to neutralize it.

In contrast, desirable scents are used for elevating mood or promoting ambience. In fact, the use of certain aroma-causing agents has been known in aroma therapy for relaxation of body and mind. Olfactory stimuli are generated by incense burning or releasing aroma-causing agents in the air. In this regard, "Scent and Environment" Iwasaki, (xxx) discloses an aroma dispensing system which is incorporated into an air conditioning system. The aroma dispensing system circulates a selected aroma-causing agent through air ducts based upon a control signal. However, the control signal is limited to the relatively constant generation of a selected scent.

The above described scent generation system is generally limited in its capability to quickly adapt to a new circumstance. In other words, the above system is substantially static and lacks dynamic adaptation over a short period of time. Thus, it is desired that a scent generation system is able to respond to control signals each of which specifies one of a variety of distinctive olfactory stimuli. A selected scent should be presented without being affected by an existing or residual scent in the

environment. Furthermore, it is also desired that the control signals are generated in response to certain conditions of the environment.

**SUMMARY OF THE INVENTION**

In order to accomplish the above and other objectives, according to one aspect of the current invention, a method of controlling olfactory stimuli, including the steps of: a) releasing a first aroma-causing agent in environment; b) storing information on the first aroma-causing agent; c) releasing a first aroma-removing agent in the environment based upon the information stored in the step b); and d) releasing a second aroma-causing agent in the environment after the step c).

According to a second aspect of the current invention, a method of controlling olfactory stimuli, including the steps of: a) measuring a predetermined characteristic of environment; b) generating an environmental signal; and c) releasing a first aroma-causing agent in the environment based upon the environmental signal.

According to a third aspect of the current invention, a system for controlling olfactory stimuli, including: an environmental measuring unit for measuring a predetermined characteristic of environment and generating an environmental signal; a controller connected to the environmental measuring unit for generating an aroma releasing signal in response to the environmental signal; an aroma storage unit for storing a plurality of aroma-causing agents; and an aroma releasing unit connected to the controller and the aroma storage unit for selectively releasing one or more of the aroma-causing agents in the environment based upon the environmental signal.

According to a fourth aspect of the current invention, a system for controlling olfactory stimuli, including: an environmental measuring unit for measuring a predetermined characteristic of environment and generating an environmental signal; a controller connected to the environmental measuring unit for generating an aroma releasing signal in response to the environmental signal; an aroma storage unit for storing a plurality of aroma-causing agents; and an aroma releasing unit connected to the controller and the aroma storage unit for selectively releasing one or more of the aroma-causing agents in the environment based upon the environmental signal.

These and various other advantages and features of novelty which characterize the invention are pointed out with particularity in the claims annexed hereto and forming a part hereof. However, for a better understanding of the invention, its advantages, and the objects obtained by its use, reference should be made to the drawings which form a further part hereof, and to the accompanying descriptive matter, in which there is illustrated and described a preferred embodiment of the invention.

### BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 diagrammatically illustrates one preferred embodiment of the olfactory stimuli control system according to the current invention.

FIGURE 2 is a flow chart illustrating steps involved in one preferred process of generating olfactory stimuli according to the current invention.

FIGURES 3A and 3B respectively illustrate some exemplary combinations of the olfactory control system and computer systems according to the current invention.

FIGURE 4 illustrates another exemplary combination of the olfactory control system and a television set according to the current invention.

FIGURE 5 illustrates another exemplary combination of the olfactory control system and an air conditioner according to the current invention.

FIGURE 6 illustrates a circuit diagram of a controller along with certain other components of the olfactory stimuli control system according to the current invention.

FIGURE 7 is a schematic for illustrating an exemplary arrangement of olfactory releasing units used in the olfactory stimuli control system according to the current invention.

FIGURE 8 is a cross sectional view of one preferred embodiment of the releasing unit used in the olfactory stimuli control system according to the current invention.

FIGURE 9 is a cross sectional view of a second preferred embodiment of the releasing unit used in the olfactory stimuli control system according to the current invention.

FIGURE 10 is a perspective view of a third preferred embodiment of the releasing unit used in the olfactory stimuli control system according to the current invention.

FIGURES 11A and 11B are respectively a cross sectional view and a top view of an aroma storage unit used in the olfactory stimuli control system according to the current invention.

FIGURE 12 is a perspective view of a fourth preferred embodiment of the releasing unit used in the olfactory stimuli control system according to the current invention.

FIGURES 13A and 13B are respectively a top view and a cross sectional view of the fourth preferred embodiment of the releasing unit used in the olfactory stimuli control system according to the current invention.

FIGURES 14A and 14B are respectively a cross sectional view and a top view of another aroma storage unit used in conjunction with the fourth preferred embodiment of the releasing unit in the olfactory stimuli control system according to the current invention.

FIGURE 15 is a perspective view of a second preferred embodiment of the olfactory stimuli control sys-

tem according to the current invention.

FIGURE 16A is an exemplary table of information on a selection of scents and a set of selection criteria which is used in the olfactory stimuli control system according to the current invention.

FIGURE 16B is a graph illustrating continuous selection of a scent over a specified time period based upon temperature and humidity as specified in the above exemplary table in FIGURE 16A.

FIGURE 16C is another exemplary table of information on a sequential selection of scents used in the olfactory stimuli control system according to the current invention.

FIGURE 17 is a circuit diagram of the second preferred embodiment of the olfactory stimuli control system according to the current invention.

FIGURE 18 is a circuit diagram of an input card reader in the second preferred embodiment of the olfactory stimuli control system according to the current invention.

FIGURE 19 is a flow chart describing the steps involved in a second preferred process according to the current invention.

FIGURE 20 is a circuit diagram of a negative ion generation unit optionally used in the olfactory stimuli control system according to the current invention.

### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT(S)

Referring now to the drawings, wherein like reference numerals designate corresponding structure throughout the views, and referring in particular to FIGURE 1, one preferred embodiment of the system for controlling olfactory stimuli is graphically illustrated. The olfactory control system 100 receives an input control signal through an interface unit (I/F) 105, and a controller 106 selectively activates one or more of aroma-causing agent releasing units or aroma releasing units 102-1 through 102-n based upon the input control signal (102-2 through 102-(n-1) are not individually illustrated). Each of the releasing units 102-1 through 102-n is connected to a corresponding independent aroma storing unit 101-1 through 101-n (101-2 through 101-(n-1) are not individually illustrated), and each aroma storing unit contains an aroma-causing agent. Thus, n distinctive aroma-causing agents stored in n aroma-storing units can make up to  $2^n$  combinations of scents. Similarly, the controller 106 also selectively activates one or more of aroma-removing agent releasing units 104-1 through 104-n based upon the input control signal (104-2 through 104-(n-1) are not individually illustrated). Each of the aroma-removing agent releasing units 104-1 through 104-n is connected to a corresponding independent aroma-removing agent storing unit 103-1 through 103-n (103-2 through 103-(n-1) are not individually illustrated), and each aroma-removing agent storing unit contains an aroma-removing agent. A fan 107 is

selectively activated based upon the input control signal for causing an air flow containing the above released agents from an air input vent 109 towards an air output vent 108.

Still referring to FIGURE 1, as described above, the input control signal specifies the activation of one or more of the aroma-causing agent releasing units 102-1 through 102-n and or one or more of the aroma-removing agent releasing units 104-1 through 104-n. As a result of simultaneous activation of certain selected aroma-causing agent releasing units 102-1 through 102-n, a plurality of the released aroma-causing agents is mixed prior to outputting through the air output vent 108. In such a mixture, the mixture is referred to as a single aroma-causing agent while the mixed aroma-causing agents are referred to as elements. Such a mixture of the aroma-causing agents generates a scent that may be distinct from any one of the stored aroma-causing agents in the system. Information on the released aroma-causing agents or the input control signal is stored in the controller 106. In order to control existing aroma which has been already released by the system prior to outputting a new scent, the input control signal or the stored information is retrieved for activating one or more of the aroma-removing agent releasing units so as to release appropriate aroma-removing agents which deactivate, suppress or remove the existing scent.

Now referring to FIGURE 2, a flow chart illustrates some of the steps involved in a preferred process of controlling olfactory stimuli. Based upon an input signal, a single aroma or a combination of scents is released in a step S150. The input signal itself or information on the released aroma is stored in a step S152 for the future use. The information includes not only the type of each released aroma-causing agent, but also the released quantity such as duration or concentration of the aroma-causing agent. In a Step 154, based upon the above stored information, a corresponding aroma-removing agent or a corresponding combination of aroma-removing agents is released so that the released aroma no longer affects the environment. The aroma-removing agent may suppresses, neutralizes or overpowers the existing aroma so as to invalidate the effect of an existing aroma. At this point, a new aroma-causing agent may be released in the same environment based upon a new or the same input signal so as to repeat the above described process. On the other hand, the process ends in a step S156.

Now referring to FIGURE 3A, one preferred embodiment 100 of the olfactory stimuli system according to the current invention is connected to a personal computer (PC) 401, which provides an input control signal to the olfactory stimuli system 100. At the same time, the personal computer 401 provides a set of audio-visual stimuli to complement the olfactory stimuli. The above PC-combined olfactory system 100, 401 is further combined with other similarly combined systems 100, 401 as well as the systems alone 100 via a network link such

as LAN and Internet as shown in FIGURE 3B. In addition, a host computer 402 is optionally connected to the network and provides an input signal or information for specifying an aroma to be generated by the olfactory system 100.

Still referring to FIGURES 3A and 3B, the above described networked olfactory stimuli systems are used to generate virtual experiences. For example, using Internet, a host computer 402 simulates a web site for a mini-mall consisting of a produce store, a florist, a bakery and etc. Upon visiting the virtual produce store, both visual and olfactory data is downloaded to a local PC so that not only visual images for example of bananas and pineapples are displayed at a PC monitor, but also their respective scent is also generated by the olfactory system 100. The scent complements the visual audio stimuli to improve the virtual experiences. Another example of the use of the olfactory system in the network includes the aroma gram in e-mail. In addition to sending textual information, an aroma signal or standard coded scent data is attached to the e-mail so that the data is decoded to generate an intended aroma upon opening the e-mail. Of course, to accomplish the above described use of aroma in a network environment, a sending side and a receiving side must share the same scent coding data, and the receiving side must be equipped with an olfactory stimuli system with storage units containing the specified aroma-causing agents.

Now referring to FIGURE 4, one preferred embodiment 100 of the olfactory stimuli system according to the current invention is connected to a television set (TV) 501, which provides audiovisual stimuli and an input control signal to the olfactory stimuli system 100. The input control signal is included in a TV broadcast signal, and upon receiving the TV signal, the TV set 501 generates audio-visual stimuli while outputting the input control signal to the olfactory system 100. The olfactory system 100 generates an olfactory stimulus based upon the input control signal to complement the audio-visual stimuli provided by the TV set 501. In general, contrast to a large amount of data for audio-visual information, since accompanying olfactory information is relatively limited, the olfactory signal is easily waved in the audio-visual signals. The use of the above described olfactory-stimuli includes enhanced TV experiences in simulating background aroma or odor. For example, for the audio-visual stimuli background scene in the forest is enhanced by generating aromas related to trees while an oceanic background becomes more realistic by generating salt water odor.

Now referring to FIGURE 5, one preferred embodiment 100 of the olfactory stimuli system according to the current invention is connected to an air conditioner (AC) 601, which provides an input control signal to the olfactory stimuli system 100. To determine what scent is to be generated by the olfactory system 100, for example, based upon a temperature that the AC 601 is set, the AC 601 generates an input control signal which is

transmitted to the olfactory system 100 via infrared. In particular, during a cold season, a tropical scent such as tropical fruit aroma including mango, papaya and pineapple may be dispensed to counterbalance the temperature while during a warm season, a certain herb aroma may be dispensed. Another example is that during an air blowing period without altering the temperature, a scent of forest may be dispensed. In contrast to the above preselected scents, a scent may be also selected by a user via a remote control. Lastly, an alternative embodiment of the olfactory stimuli system 100 may be included in an AC unit rather than a separate unit.

FIGURE 6 diagrammatically illustrates certain components of a controller 106 as shown in FIGURE 1. One implementation of the controller 106 includes a pair of control circuits 2203 and 2204 as well as a pair of corresponding operational circuits 2201 and 2202. In general, the control circuits 2203 and 2204 select certain operation of the operational circuits 2201 and 2202 for physically activating the selected releasing units. The control circuits 2203 and 2204 also control the operation of a fan 107 for generating an air flow after the selected aroma-causing agents are released. The control circuit 2203 via the operational circuit 2201 ultimately controls a set of aroma-causing agent releasing units A1 through A5 as well as corresponding aroma-removing agent releasing units B1 through B5. Similarly, the control circuit 2204 via the operational circuit 2202 ultimately controls a set of aroma-causing agent releasing units A6 through A13 as well as corresponding aroma-removing agent releasing units B6 through B13. Thus, the control circuits 2203 and 2204 control the generation of a selected scent which may be a mixture of the aroma-causing agents. After the release of the selected scent, the control circuits 2203 and 2204 also control the removal, neutralization or suppression of the released scent by a mixture of the aroma-removing agents.

Now referring to FIGURE 7, a perspective view illustrates one preferred arrangement of the above described aroma-causing agent releasing units A1 through A13 and aroma-removing agent releasing units B1 through B13. Each of these units is independently controlled by a controller. In this arrangement, one aroma-causing agent releasing unit and its corresponding aroma-removing agent releasing unit are alternately juxtaposed. Furthermore, each of the aroma-causing agent releasing units A1 through A13 is placed adjacent to its corresponding one of aroma-causing agent storage unit A1' through A13' while each of the aroma-removing agent releasing units B1 through B13 is also placed adjacent to its corresponding one of aroma-removing agent storage units B1' through B13'. Close proximity of the releasing units A1 through A13 as well as B1 through B13 promotes efficient mixture of the released agents before outputted from the olfactory stimuli system.

Referring to FIGURE 8, one preferred embodiment of the releasing unit according to the current invention is

diagrammatically illustrated in a cross sectional view. In general, the preferred embodiment is substantially similar to an On-demand-type ink-jet printer head with piezoelectric vibrators for discharging an aroma-causing agent or an aroma-removing agent. In general, an aroma-causing agent releasing unit 102 is substantially identical to an aroma-removing agent releasing unit 104 except for the agent to be released. Each releasing unit includes a pair of piezoelectric vibrators 201 and 202 which are located outside of a housing near a corresponding cavity 203 and 204. An agent enters the releasing unit 102 or 104 through an input pipe 205, and the vibration causes the liquid agent to discharge through an output nozzle 206 in mist. The piezoelectric vibrators 201 and 202 are activated by a predetermined frequency signal. An alternative embodiment of the releasing unit includes an on-demand type bubble-jet printer head.

Now referring to FIGURE 9, a second preferred embodiment of the releasing unit according to the current invention is diagrammatically illustrated in a cross sectional view. A sprayer 701 generates mist or spray of an aroma agent stored in a storage unit 702 near an air nozzle 701 and an aroma liquid releasing nozzle 702a at an onset of an electromagnetic valve 701c for releasing compressed air stored in a compressed air tank 701b. In general, the second preferred embodiment is suitable for releasing a large amount of an aroma-causing agent and or an aroma-removing agent. Alternative embodiments of the second embodiments include air compressor in lieu of the compressed air tank 701b as well as introducing the compressed air in the aroma liquid storage tank for generating spray.

Referring to FIGURE 10, a third preferred embodiment of the releasing unit according to the current invention is illustrated in a perspective view. In general, the third preferred embodiment mechanically breaks and or squeezes an aromatic agent stored in a capsule. Each capsule is placed on a roll 800 and placed over a board 901. When a corresponding one of plungers A1 through A13 or B1 through B13 is activated in such a way that a roller 902 is pressed against the roll 800 via a pivot 905, the capsule is broken and consequently the stored aromatic agent is released in the air. A plurality of the plungers is simultaneously activated to cause a selected combination of the agents to be released in the air. Alternatively, the size of the roller 902 is modified to rupture either a single capsule or a plurality of capsules. After the selected activation, the roll 800 is rolled over a retracting roll via a driving motor 903 as indicated by an arrow. As the exposed capsules are retracted, the ruptured portion may be automatically sealed by a piece of tape so that the residual agent is substantially prevented from being continuously released. After retracting the roll 800, a new portion of the unbroken capsule is placed over the board 901 for the next activation. It is also possible to continuously release the agent by moving the roll 800 while pressing the roller 902 against the

roll 800.

Referring to FIGURES 11A and 11B, some detailed construction of the roll 800 is further described. FIGURE 11A illustrates a cross sectional view. The roll 800 includes a predetermined number of capsules 801, each of which contains either an aroma-causing agent or an aroma-removing agent 801a. The capsules 801 containing the agent 801a are fixed on a roll substrate 802 with a binder 803. Some examples of the roll substrate include a sheet of paper, cloth and plastic. As described above, the capsules 801 is each ruptured in response to a predetermined amount of pressure or heat for releasing the content. FIGURE 11B illustrates a top view of the roll 800. According to one preferred embodiment, aroma-causing agent containing capsules A1' through A13' and aroma-removing agent containing capsules B1' through B13' are alternately juxtaposed in the direction of moving the roll 800.

Now referring to FIGURE 12, a fourth preferred embodiment of the releasing unit according to the current invention is illustrated in a perspective view. In general, the fourth preferred embodiment thermally initiates the release of aromatic agent. As a sheet of thermally sensitive aroma-releasing material 1100 is rolled in a direction as indicated by an arrow towards a retracting roller 1203, an unused portion of the sheet is heated by a thermal head 1201 over a platen roller 1202.

FIGURES 13A and 13B respectively illustrate a top view and a side view of one implementation of the above described thermal head. This implementation of the thermal head includes a common electrode 1301, a separate electrodes 1302 and an optimally placed resistor 1303 which generates heat. According to the implementation, the heat generating resistor is located above the electrodes 1301 and 1302 and transfers heat onto the a heat-sensitive medium.

FIGURES 14A and 14B respectively illustrate a cross sectional view and a top view of the heat-sensitive aroma roll 1100. One exemplary construction of the heat-sensitive roll 1100 contains an aroma-causing agent and or an aroma-removing agent which are represented by particles 1101. The particles 1101 are generally imbedded in a binder material 1103, and the binder material 1103 containing the particles 1101 is placed over a base medium 1102 such as a sheet of paper, cloth or plastic. As shown in FIGURE 14B, a collection of the above described strips each containing a distinct aromatic agent forms the roll 1100. According to one preferred embodiment, aroma-causing agent containing strips A1' through A13' and aroma-removing agent containing strips B1' through B13' are alternately juxtaposed in the direction of moving the roll 1100. When a particular strip is heated by a corresponding individual electrode 1302 as shown in FIGURE 13A, an aroma from the particles 1101 is released into the air.

Now referring to FIGURE 15, a second preferred embodiment of the olfactory stimuli control system according to the current invention is illustrated in a per-

spective view. Although the second embodiment is illustrated as a portable desk-top unit for generating aroma in a confide space, alternative embodiments include one or more of the following unique features. In general, the second preferred embodiment of the olfactory stimuli system includes a memory card 1402 and a portable unit 1401. The portable unit 1401 has an opening 1405 for accepting the memory card 1402 for reading information stored on a magnetic surface and uses the information in generating an aroma. The memory card 1402 also has a second decorated surface for indicating a type of a scent in a picture. The portable unit 1402 inputs fresh air through an input vent 1403 and outputs the scented air through an output vent 1404. In addition to the information input by the memory card 1402, the portable unit 1401 measures a certain predetermined characteristic of the environment and generates an aroma based upon the memory card information and the measured characteristic.

Referring to FIGURE 16A, one example of information contained in the above described memory card 1402 is illustrated in a table format. Depending upon a combination of temperature and humidity of the environment, a scent is selected. The information also specifies an amount of time for releasing the selected scent and an associated releasing unit from which the selected scent is released. Lastly, each scent is numbered by a unique number. Although this example shows that the humidity dictates over the temperature, the combination is not limited to the above priority or the two environmental factors. Furthermore, the above exemplary information is also stored in an internal permanent storage such as a read only memory (ROM) and is used as default information in the absence of any inputted information to override the default information.

FIGURE 16B is a graph illustrating continuous selection of a scent over a specified time period based upon temperature and humidity as specified in the above exemplary table in FIGURE 16A. The olfactory stimuli control system according to the current invention periodically monitors scent selection criteria such as temperature and humidity and selects an aroma based upon the actually measured temperature and humidity values for continuously releasing the same aroma until a new aroma is selected. For example, between 7:00AM and 8:12AM, on a particular day, assuming that humidity is between 30% and 70% while temperature is below 18°C, a mango scent is selected according to the above information table. However, after 8:12AM, since humidity changes below 30% while temperature remains below 18°C, a papaya scent is now selected. At 8:50AM, since temperature changes above 18°C while humidity stays below 30%, a beech tree scent is selected. By the same manner, temperature and humidity are continuously monitored and a scent is continuously selected based upon the combination of the measured values until 7:00PM according to this example.

FIGURE 16C is another exemplary table of information on a sequential selection of scents used in the olfactory stimuli control system according to the current invention. For example, the sequential selection information is stored in a card memory in a predetermined manner. In general, upon reading the card memory, the olfactory stimuli control system according to the current invention overrides an ongoing operation and sequentially releases a series of the scents specified in the card memory. According to this exemplary information, in a first event, negative ions are released for 180 second, and in a second event, a mugwort scent is released from a A6 releasing unit for 20 seconds at a time for 120 seconds in total with a 50 second interval. A sequence of other scent releases and scent removals is performed as specified in the card memory until the tenth event is completed.

Referring to FIGURE 17, the above described second preferred embodiment of the olfactory stimuli control system according to the current invention is illustrated in a circuit diagram. The second preferred embodiment 1401 includes a card reader 1601, a set of predetermined sensors and amplifiers, a central processing unit (CPU) 1602, a timer 1605, a read-only memory unit (ROM) 1603, a random-access memory unit 1604, an operational circuit 1607 and an aroma releasing unit 1606. In general, the sensors A, B and C respectively measure a predetermined characteristic and generate corresponding environmental signals. The sensor A includes a thermistor and measures the environmental temperature. The sensor B includes a pair of thermistors and measures humidity. The sensor C includes an odor detector such as a metal oxide semiconductor for detecting cigarette odor. Amplifiers A, B and C respectively amplify and digitally convert the environmental signals.

Still referring to FIGURE 17, the CPU 1602 receives the above described memory card information from the card reader 1601, as well as the environmental signals from the sensors A, B and C. The CPU 1602 also reads control programs as well as some default information from the ROM 1603. The CPU 1602 then tentatively stores the above information, program and signals in a RAM 1604. If the memory card information is available, the CPU 1602 determines which aroma is to be generated based upon the environmental signal in reference to the memory card information. On the other hand, if the memory card information is not available, the CPU 1602 determines which aroma is to be generated based upon the environmental signal and the default information from the ROM 1603. After selecting an aroma, the CPU 1602 accordingly controls the operational circuit 1607 for releasing a selected aroma or a combination of the selected aromas via the aroma releasing unit 1606. The CPU 1602 also stores information on the currently released aroma so that prior to releasing a next aroma, the previously released aroma is substantially removed, neutralized or weakened by

releasing a corresponding aroma-removing agent based upon the stored information. The timer 1605 is used for controlling the duration of the release as well as tracking an amount of time between releases of any aroma. Lastly, although the above described second preferred embodiment is illustrated as an independent unit with a card reader input, the second preferred embodiment is also interfaced with other input devices or a network for inputting aroma release information.

Referring to FIGURE 18, the above described card reader 1601 is further described in a circuit diagram along with an aroma releasing unit 1501 which releases an aroma-causing agent and or an aroma-removing agent and a fan FN is located in the vicinity of the aroma releasing unit 1501. When a memory card is partially inserted into the olfactory stimuli unit, the card edge closes a micro switch MS which activates a memory card transfer motor M for automatically transferring the card to the fully inserted position. The memory card transfer motor M is powered by a power source E. During the transfer, the information is read from the memory card. At the fully inserted position, the leading edge of the memory card turns a plunger switch PS to an alternate position for causing the transfer motor M to rotate in an opposite direction. Consequently, the memory card is ejected, and the plunger switch PS is reverted to an original position while the micro switch MS is turned off.

Referring to FIGURE 19, some critical steps of the second preferred process of generating an olfactory stimulus according to the current invention are illustrated in a flow chart. In general, the second preferred process includes a step of measuring at least one predetermined environmental characteristic in a step S200. The predetermined characteristic includes temperature, humidity and a presence of a certain odor. Based upon the measuring step S200, a corresponding environmental signal is generated in a step S202. The environmental signal is used to select an aroma from either a default source of data or an alternate source of information. In a step S204, if the alternative source of information is available after inputted for example by a memory card, a certain scent is selected from the inputted information based upon the environmental signal in a step S206. On the other hand, if the alternative source of information has not been inputted, based upon the environmental signal, a certain scent is selected from a default set of data which has been stored for example in a ROM in a step S208. Finally, the selected scent is released in a step S210. The above steps may be automatically repeated with a predetermined interval in the absence of a user selection of an aroma.

Alternative processes of generating an olfactory stimulus according to the current invention include a combination of the above described first and second preferred processes. In other words, the combined alternative process include additional steps of storing information on the aroma which has been selected

based upon an environmental characteristic as well as substantially eliminating the released aroma by neutralizing, weakening or overpowering with a corresponding aroma-removing agent. The combined alternative process optionally further includes a step of releasing a new aroma after the first aroma has been substantially eliminated. Another alternative process includes a step of inputting the alternative source of information. As shown in an exemplary table of FIGURE 16, the alternative source of information may include a different order of parameters, a different set of ranges for each parameter as well as a different set of aromas to be released.

Now referring to FIGURE 20, to effectively remove a residual aroma from a previous release, one preferred embodiment of the olfactory stimuli control system includes a negative ion generation unit 1701, which may be placed near a fan 107. The circuit diagram illustrates a metal wire 1801, a metal plate 1802, a power source 1803 and a switch 1804. In general, it has been known that negative ions are generally perceived as a pleasant odor, and the negative ions can be also combined with an aroma-removing agent.

It is to be understood, however, that even though numerous characteristics and advantages of the present invention have been set forth in the foregoing description, together with details of the structure and function of the invention, the disclosure is illustrative only, and that although changes may be made in detail, especially in matters of shape, size and arrangement of parts, as well as implementation in software, hardware, or a combination of both, the changes are within the principles of the invention to the full extent indicated by the broad general meaning of the terms in which the appended claims are expressed.

## Claims

1. A method of controlling olfactory stimuli, comprising the steps of:
  - a) measuring a predetermined characteristic of environment;
  - b) generating an environmental signal; and
  - c) releasing a first aroma-causing agent in the environment based upon said environmental signal.
2. The method of controlling olfactory stimuli according to claim 1, wherein said predetermined characteristic includes temperature.
3. The method of controlling olfactory stimuli according to claim 1 or 2, wherein said predetermined characteristic includes humidity.
4. The method of controlling olfactory stimuli according to claims 1 to 3, wherein said predetermined characteristic includes a predetermined type of

5. The method of controlling olfactory stimuli according to claims 1 to 4, further comprising an additional step d) of storing said environmental signal.
6. The method of controlling olfactory stimuli according to claims 1 to 5, further including an additional step of inputting information on a predetermined set of selected aroma-causing agents prior to said step c) for releasing said first aroma-causing agent in response to said environmental signal.
7. The method of controlling olfactory stimuli according to one of the preceding claims, wherein said first aroma-causing agent is a mixture of a plurality of aroma-causing elements.
8. The method of controlling olfactory stimuli according to one of the preceding claims, further comprising an additional step of i) of inputting a first input signal indicative of specifying said first aroma-causing agent.
9. The method of controlling olfactory stimuli according to claim 11, wherein said first input signal also indicates strength of said first aroma-causing agent.
10. The method of controlling olfactory stimuli according to one of the preceding claims, wherein said first aroma-causing agent is stored in a liquid form.
11. The method of controlling olfactory stimuli according to one of the preceding claims, wherein said first aroma-causing agent is stored in a solid form.
12. The method of controlling olfactory stimuli, wherein a step d) of releasing a first aroma-causing agent in the environment is performed, said method in particular according to claims 1 to 11 comprising thereafter the additional steps of:
  - e) storing information on said first aroma-causing agent;
  - f) releasing a first aroma-removing agent in the environment based upon said information stored in said step e); and
  - g) releasing a second aroma-causing agent in the environment after said step f).
13. The method of controlling olfactory stimuli according to claim 12, wherein said second aroma-causing agent is a mixture of a plurality of aroma-causing elements.
14. The method of controlling olfactory stimuli according to one of the claims 12 or 13, wherein said

aroma-removing agent is a mixture of a plurality of aroma-removing elements.

15. The method of controlling olfactory stimuli according to one of the preceding claims 12 to 14, further comprising an additional step of j) of inputting a second input signal indicative of specifying said second aroma-causing agent. 5

16. The method of controlling olfactory stimuli according to claims 12 to 15, wherein said step f) substantially eliminates said first aroma-causing agent. 10

17. The method of controlling olfactory stimuli according to claims 12 to 16, wherein said step f) weakens said first aroma-causing agent to a predetermined extent and leaves a predetermined remaining portion of said first aroma-causing agent. 15

18. The method of controlling olfactory stimuli according to claim 17, wherein said step g) mixes said remaining portion of said first aroma-causing agent and said second aroma-causing agent. 20

19. The method of controlling olfactory stimuli according to claims 12 to 18, wherein said steps d) through g) are performed in the environment where audio-visual stimuli are provided to complement the olfactory stimuli. 25

20. A system for controlling olfactory stimuli, comprising: 30

an environmental measuring unit for measuring a predetermined characteristic of environment and generating an environmental signal; 35

a controller connected to said environmental measuring unit for generating an aroma releasing signal in response to said environmental signal;

a first aroma storage unit for storing one or a plurality of first aroma-causing agents; and

a first aroma releasing unit connected to said controller and said aroma storage unit for selectively releasing one or more of said first aroma-causing agents in the environment based upon said environmental signal. 40

21. The system for controlling olfactory stimuli according to claim 20, wherein said environmental measuring unit measures temperature. 50

22. The system for controlling olfactory stimuli according to claims 20 or 21, wherein said environmental measuring unit measures humidity. 55

23. The system for controlling olfactory stimuli according to claims 20 to 22, wherein said environmental

measuring unit at least senses a predetermined type of aroma.

24. The system for controlling olfactory stimuli according to claims 20 to 23, said controller stores said environmental signal.

25. The system for controlling olfactory stimuli according to claims 20 to 24, wherein one or more of said first aroma-causing agent is a mixture of a plurality of aroma-causing elements.

26. The system for controlling olfactory stimuli, wherein a controller stores an aroma releasing signal generated by said controller, a first aroma storage unit stores an aroma-causing agent, and a first aroma releasing unit is connected to said storage unit and said controller for releasing said aroma-causing agent in environment based upon said aroma release signal, and the system in particular according to claims 20 to 25 further comprising:

a second aroma storage unit for storing an aroma-removing agent; and

a second aroma releasing unit connected to said second aroma storage unit and said controller for releasing said aroma-removing agent in the environment based upon said stored aroma releasing signal.

27. The system for controlling olfactory stimuli according to claim 26, further comprising:

a third aroma storage unit for storing a second aroma-causing agent; and

a third aroma releasing agent connected to said third aroma storage unit and said controller for releasing said second aroma-causing agent in the environment based upon a second aroma releasing signal.

28. The system for controlling olfactory stimuli according to claim 26 or 27, wherein said second aroma-causing agent is a mixture of a plurality of aroma-causing elements.

29. The system for controlling olfactory stimuli according to claims 26 to 28, wherein said aroma-removing agent is a mixture of a plurality of aroma-removing elements.

30. The system for controlling olfactory stimuli according to claims 20 to 29, further comprising an input unit connected to said controller for inputting information on a predetermined set of selected first and/or second aroma-causing agents from which an aroma releasing signal is generated.

31. The system for controlling olfactory stimuli according to claims 26 to 30, further comprising an inputting unit connected to said controller for inputting an input signal indicative of specifying said aroma-causing agent. 5

32. The system for controlling olfactory stimuli according to claim 31, wherein said input signal also indicates strength of said aroma-causing agent. 10

33. The system for controlling olfactory stimuli according to claim 25, wherein said inputting unit further includes an interface unit for interfacing said input signal from an outside unit to said controller. 15

34. The system for controlling olfactory stimuli according to claim 33, wherein said outside unit includes a television unit, a personal computer, an air conditioner and a memory card. 20

35. The system for controlling olfactory stimuli according to claims 26 to 34, wherein said aroma-removing agent substantially eliminates said aroma-causing agent. 25

36. The system for controlling olfactory stimuli according to claims 26 to 34, wherein said aroma-removing agent weakens said aroma-causing agent to a predetermined extent and leaves a predetermined remaining portion of said aroma-causing agent. 30

37. The system for controlling olfactory stimuli according to claims 26 to 36, wherein said aroma-removing agent is negative ion. 35

38. The system for controlling olfactory stimuli according to claims 26 to 36, wherein said aroma-removing agent chemically neutralizes said aroma-causing agent. 40

39. The system for controlling olfactory stimuli according to claims 26 to 37, wherein said aroma-removing agent overpowers said aroma-causing agent. 45

40. The system for controlling olfactory stimuli according to claims 20 to 39, wherein at least one of said aroma-causing agents is stored in a liquid form. 50

41. The system for controlling olfactory stimuli according to claim 40, wherein said releasing unit includes an ink-jet printer head. 55

42. The system for controlling olfactory stimuli according to claim 40, wherein said releasing unit includes a sprayer.

43. The system for controlling olfactory stimuli according to claim 40, wherein said storing unit is a pressure breakable capsule, said releasing unit applying a predetermined pressure to said pressure breakable capsule for releasing said aroma-causing agent.

44. The system for controlling olfactory stimuli according to claims 40 to 43, wherein said storing unit is a thermally breakable capsule, said releasing unit applying predetermined heat to said thermally breakable capsule for releasing said aroma-causing agent.

45. The system for controlling olfactory stimuli according to claims 20 to 44, wherein at least one of said first aroma-causing agent is stored in a solid form.

46. The system for controlling olfactory stimuli according to claim 45, wherein said storing unit is a thermally sensitive medium, said releasing unit applying predetermined heat to said thermally sensitive medium for releasing said aroma-causing agent.

47. The system for controlling olfactory stimuli according to claim 45, wherein said thermally sensitive medium is a roll of sheet on which a plurality of said aroma-causing agents is embedded.

48. The system for controlling olfactory stimuli according to claims 20 to 47, further comprising an audio-visual unit for providing audio-visual stimuli in the environment.

FIG. 1

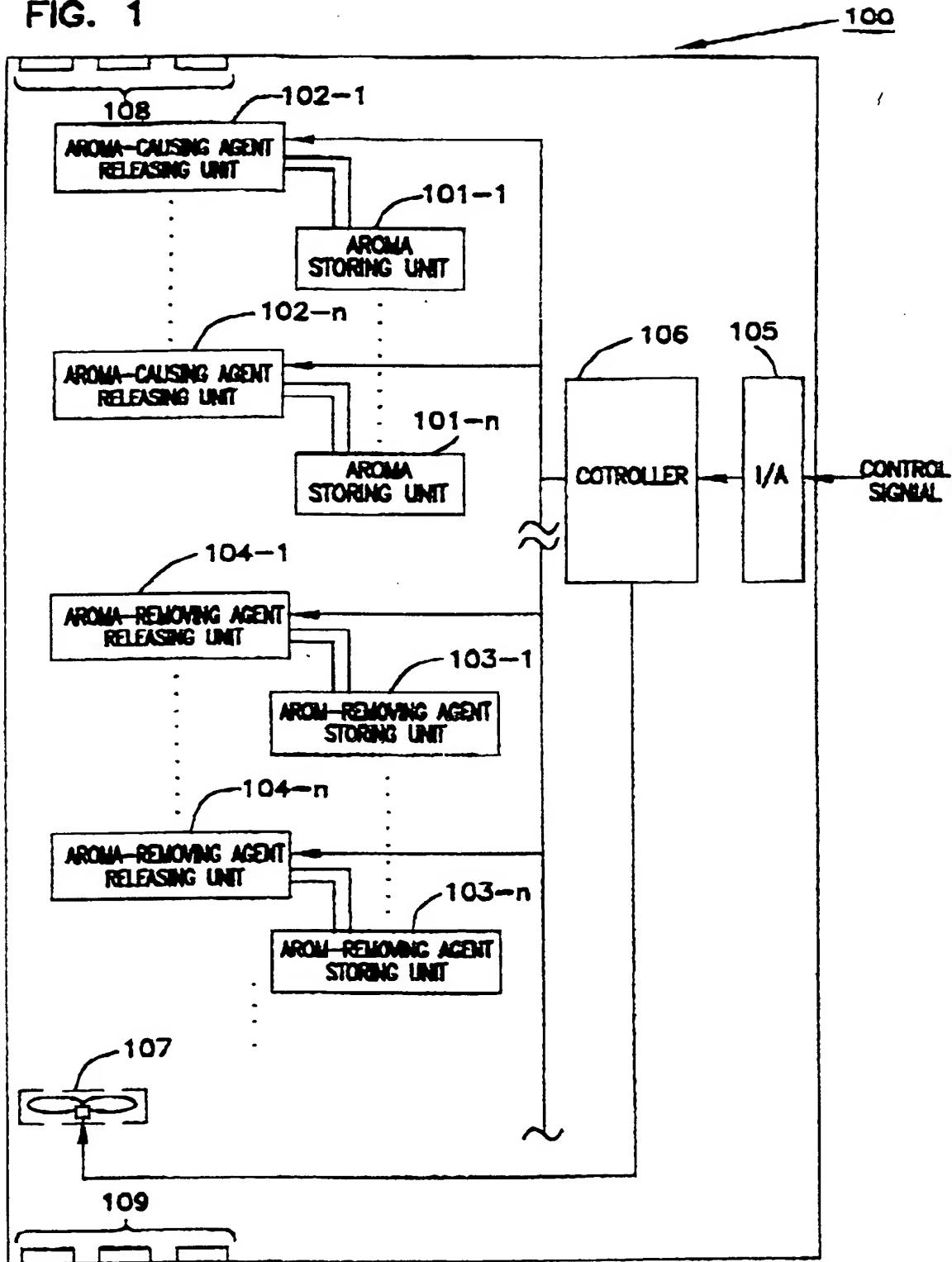


FIG. 2

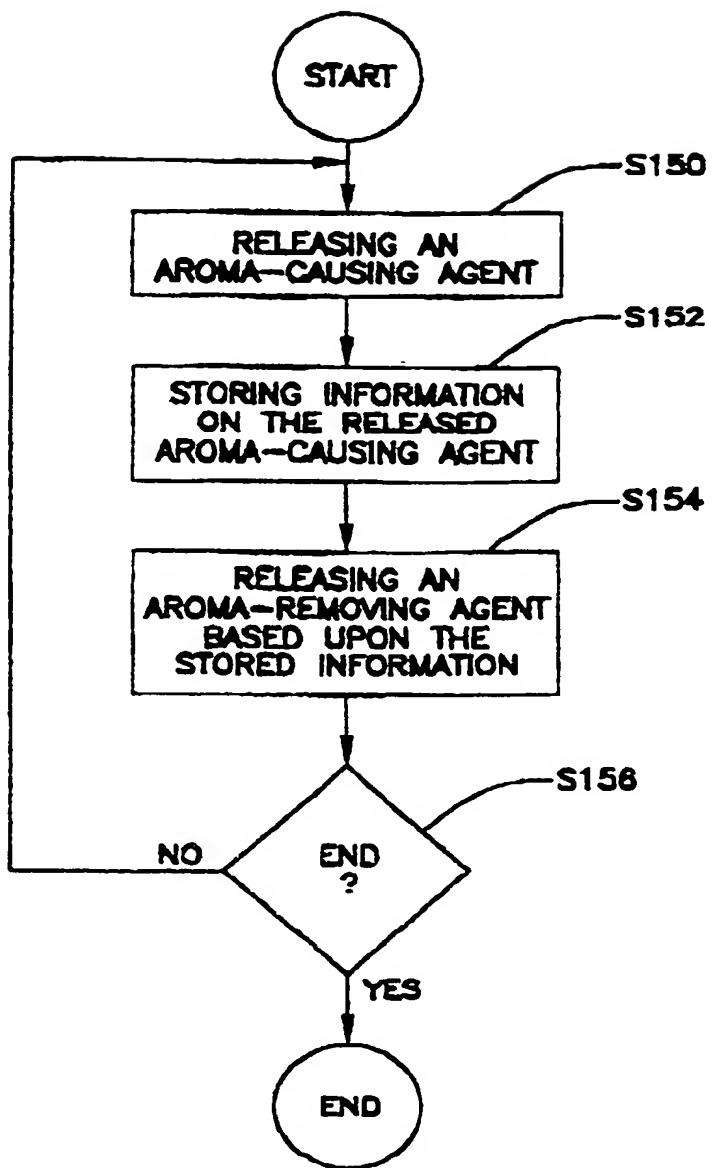


FIG. 3A

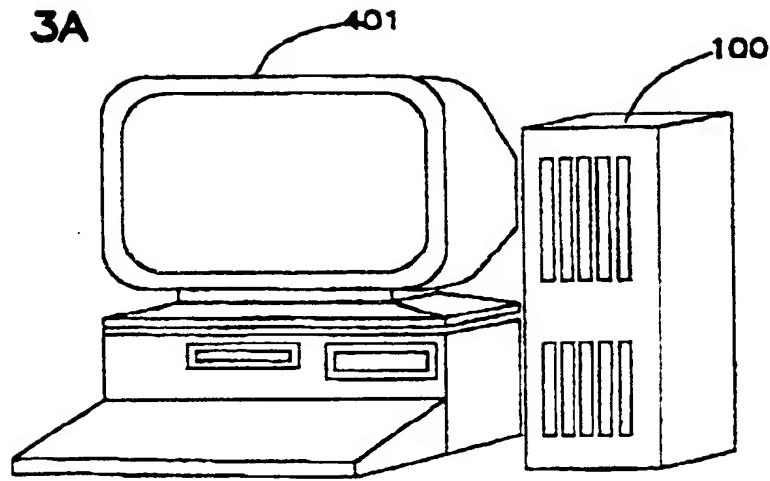


FIG. 3B

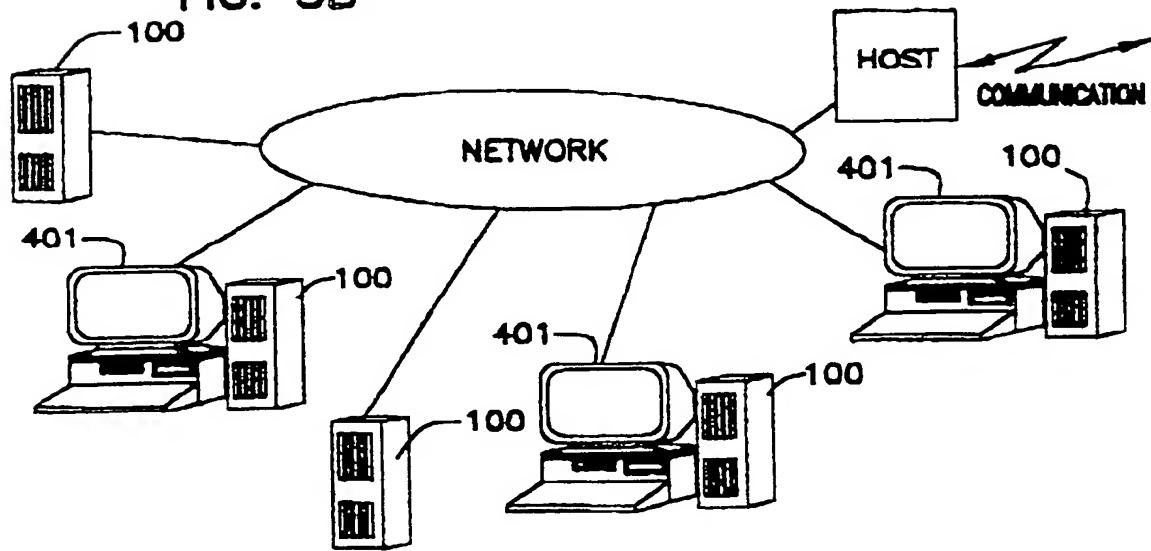


FIG. 4

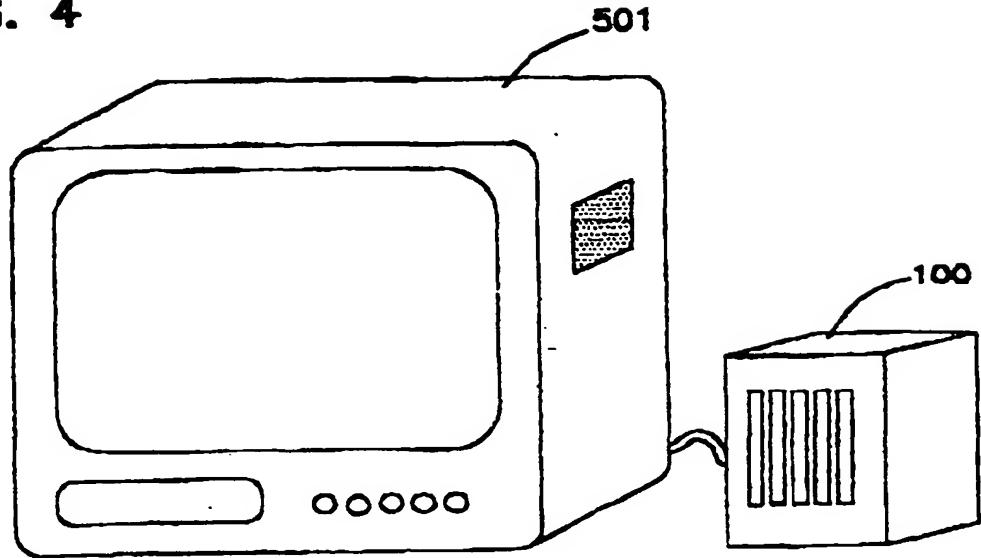


FIG. 5

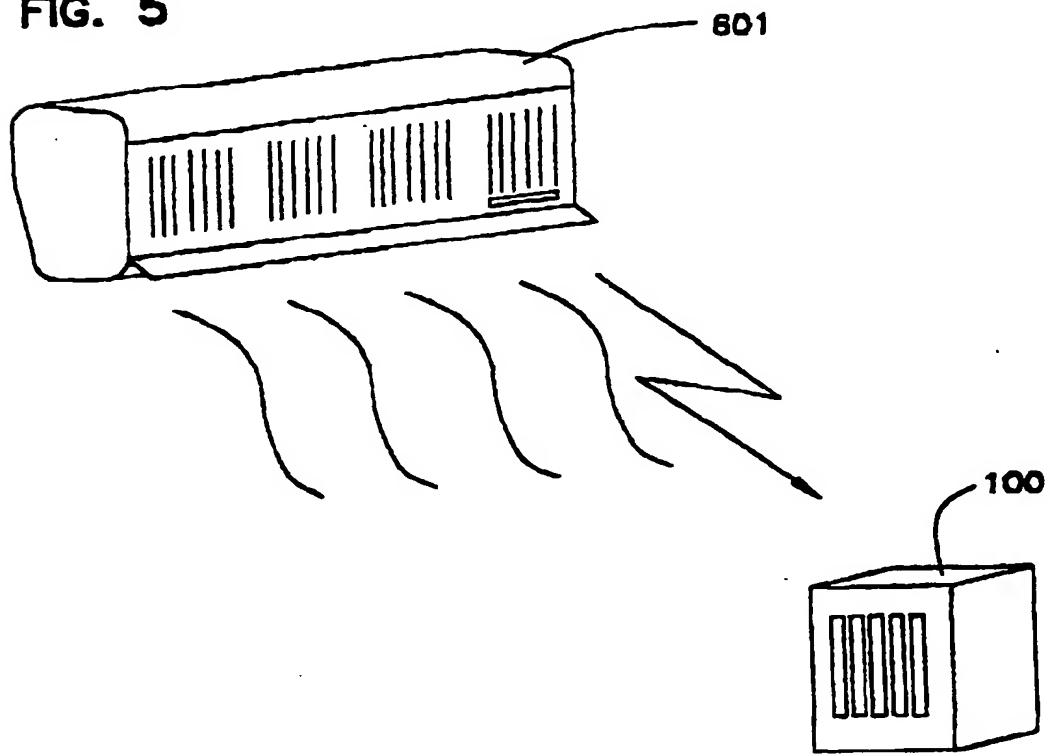


FIG. 6

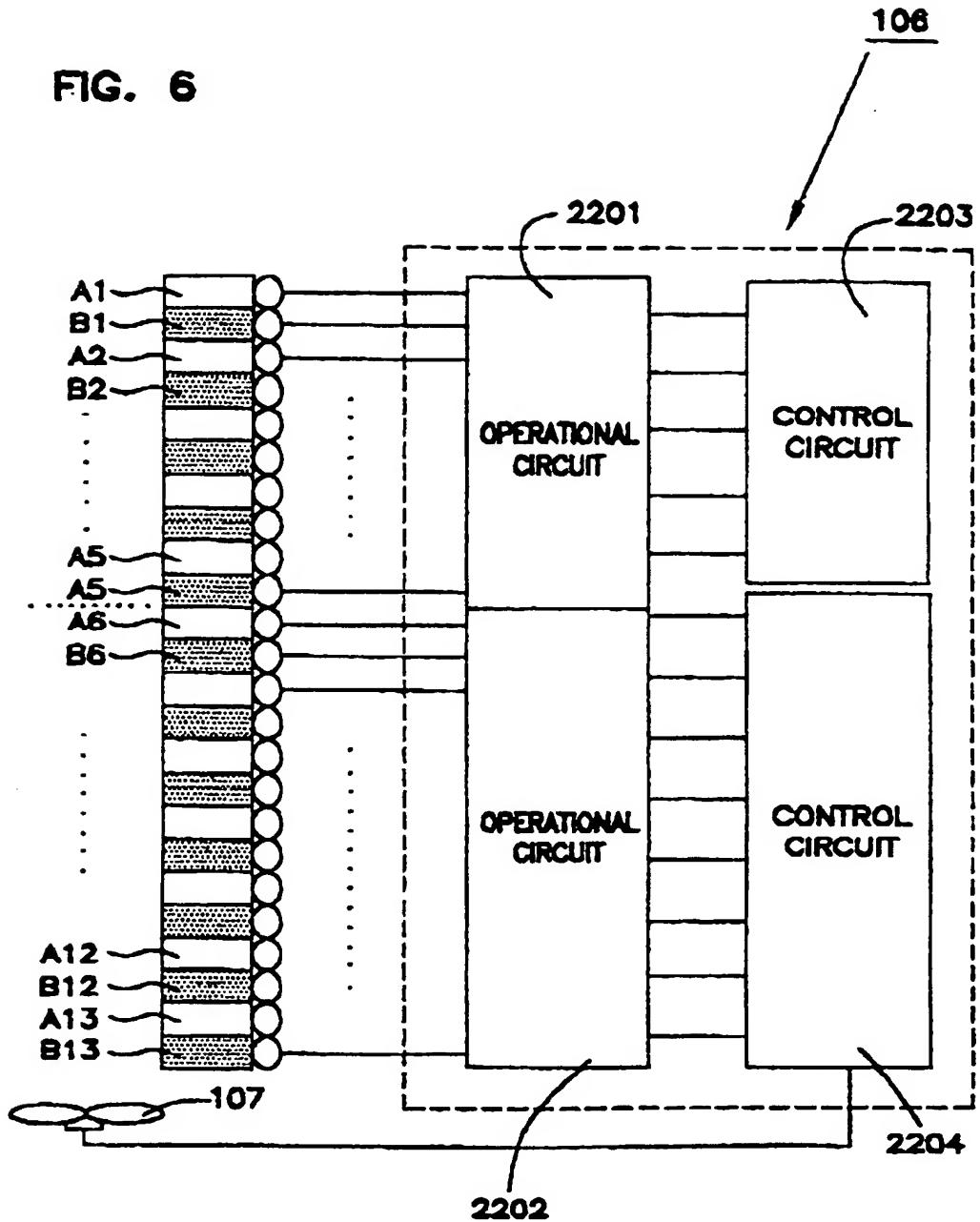
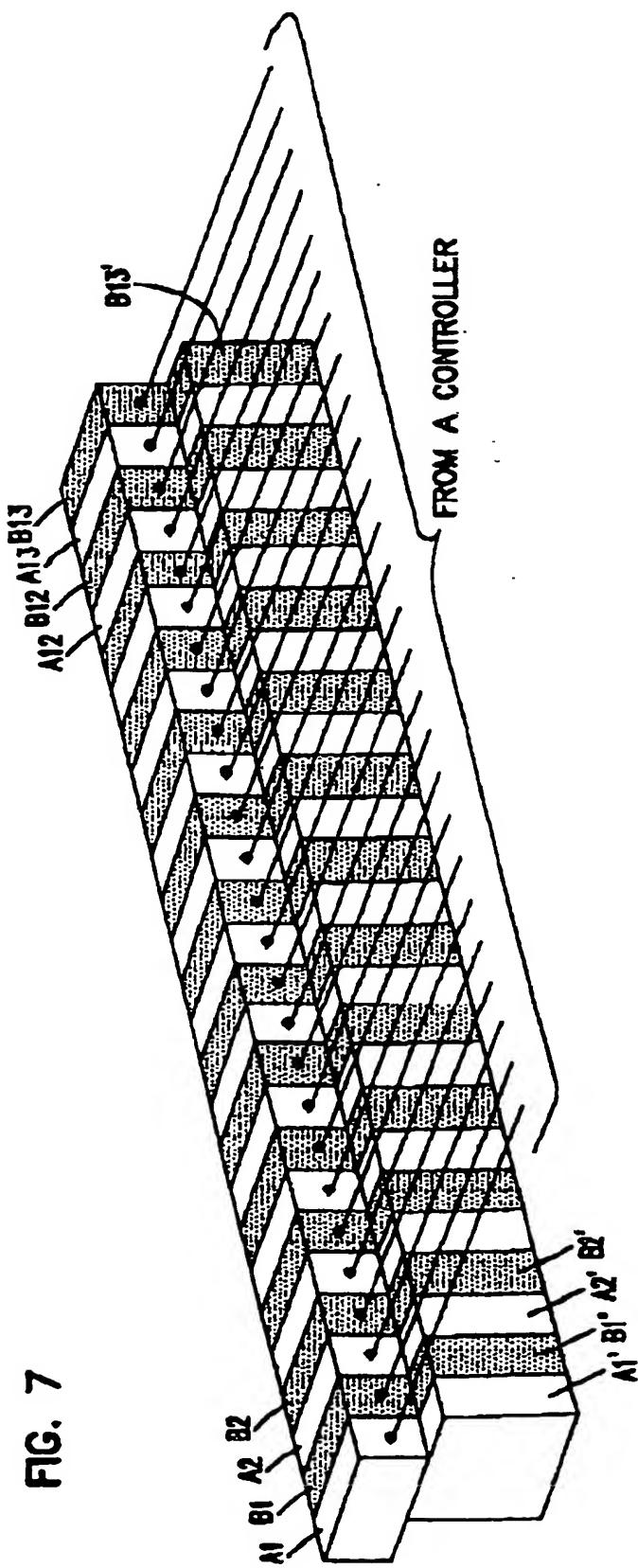


FIG. 7



A1, A1'; AROMA-CAUSING AGENT RELEASING UNIT 102  
A13, A13'; AROMA-CAUSING AGENT STORAGE UNIT 101  
B13, B13'; AROMA-REMOVING AGENT RELEASING UNIT 104  
B1, B1'; AROMA-REMOVING AGENT STORAGE UNIT 103

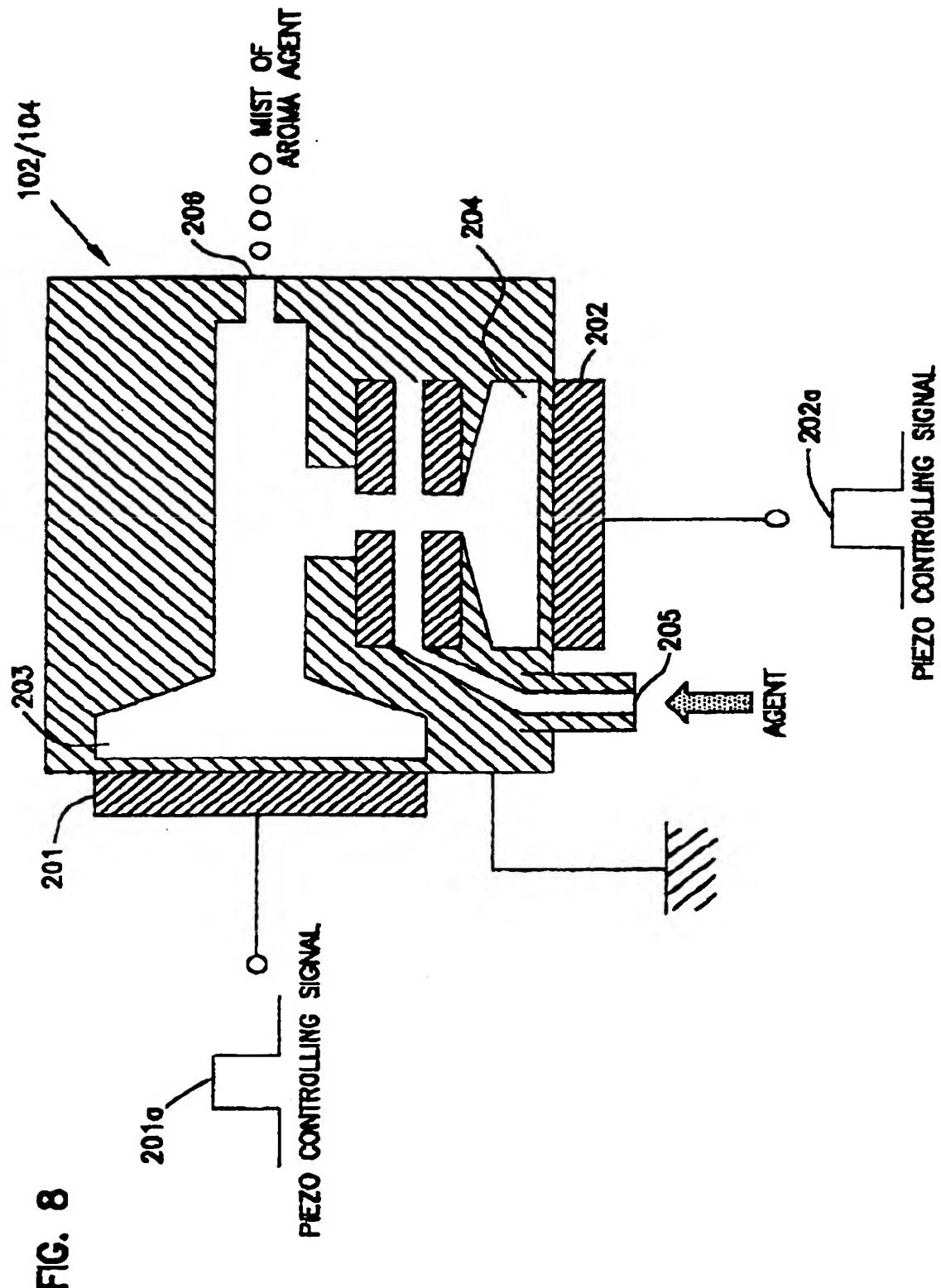


FIG. 9

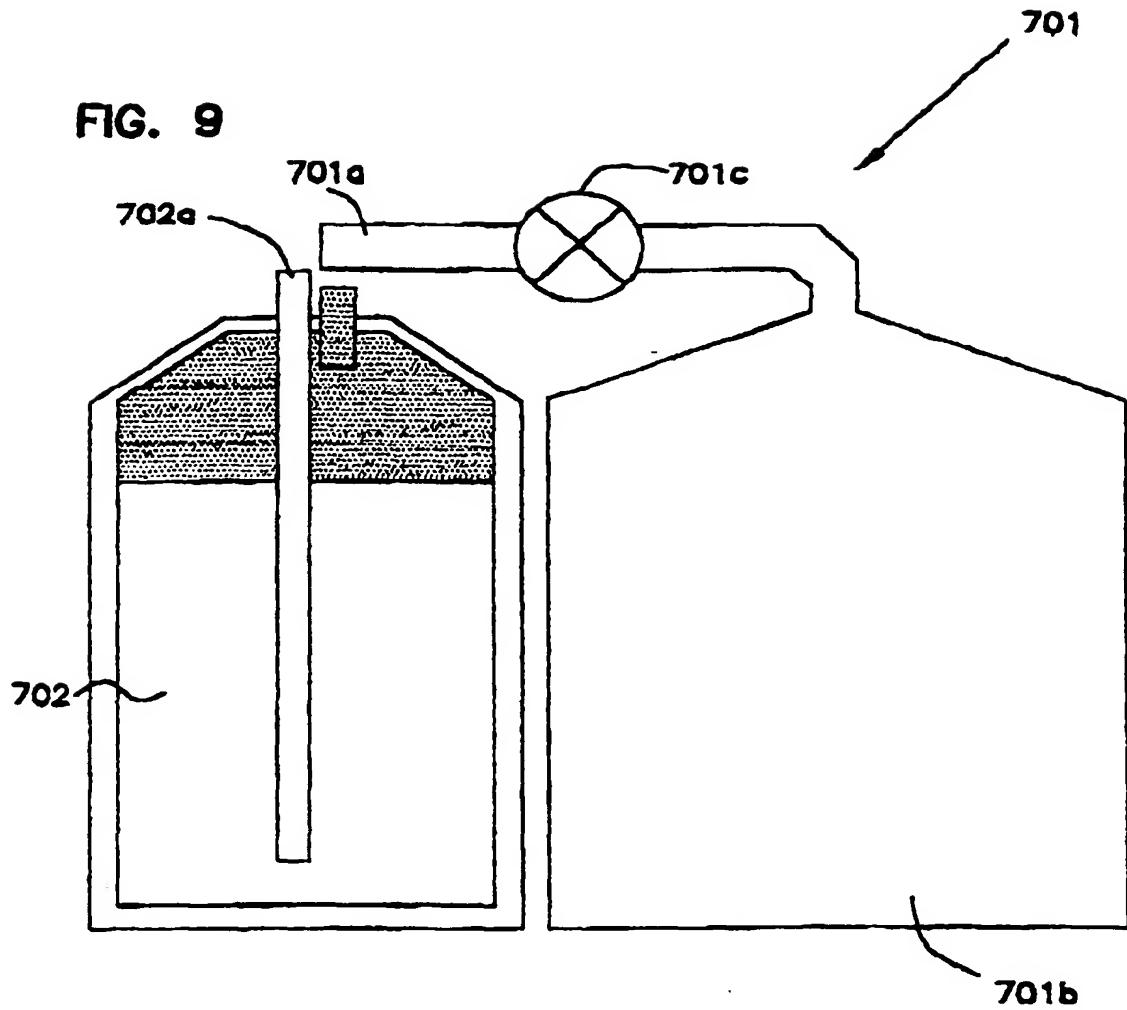


FIG. 10

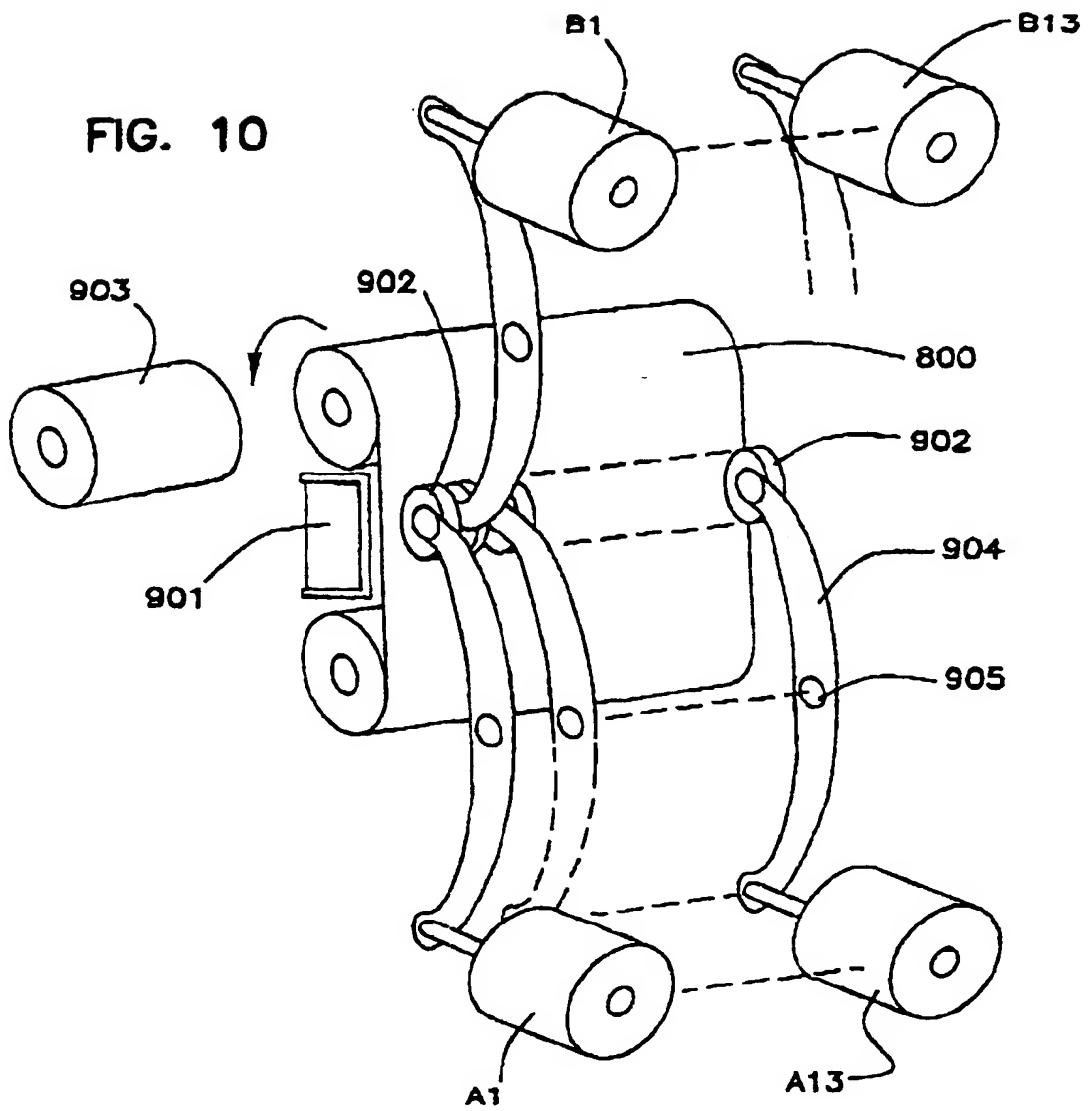


FIG. 11A

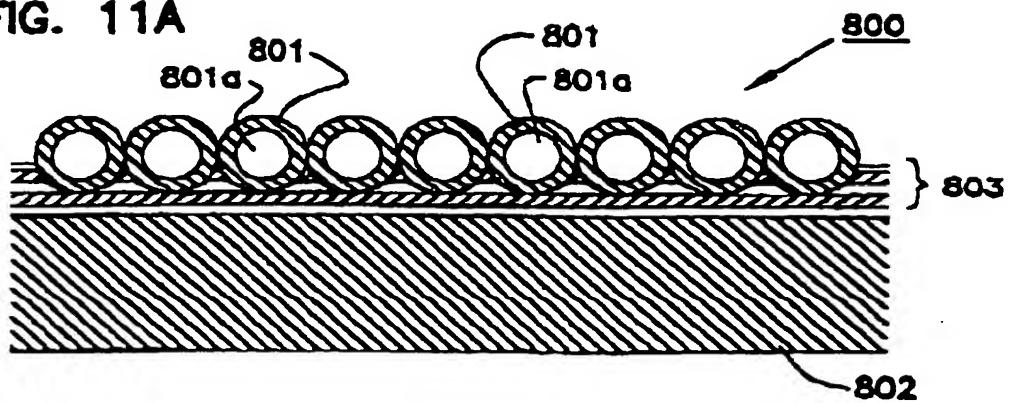


FIG. 11B

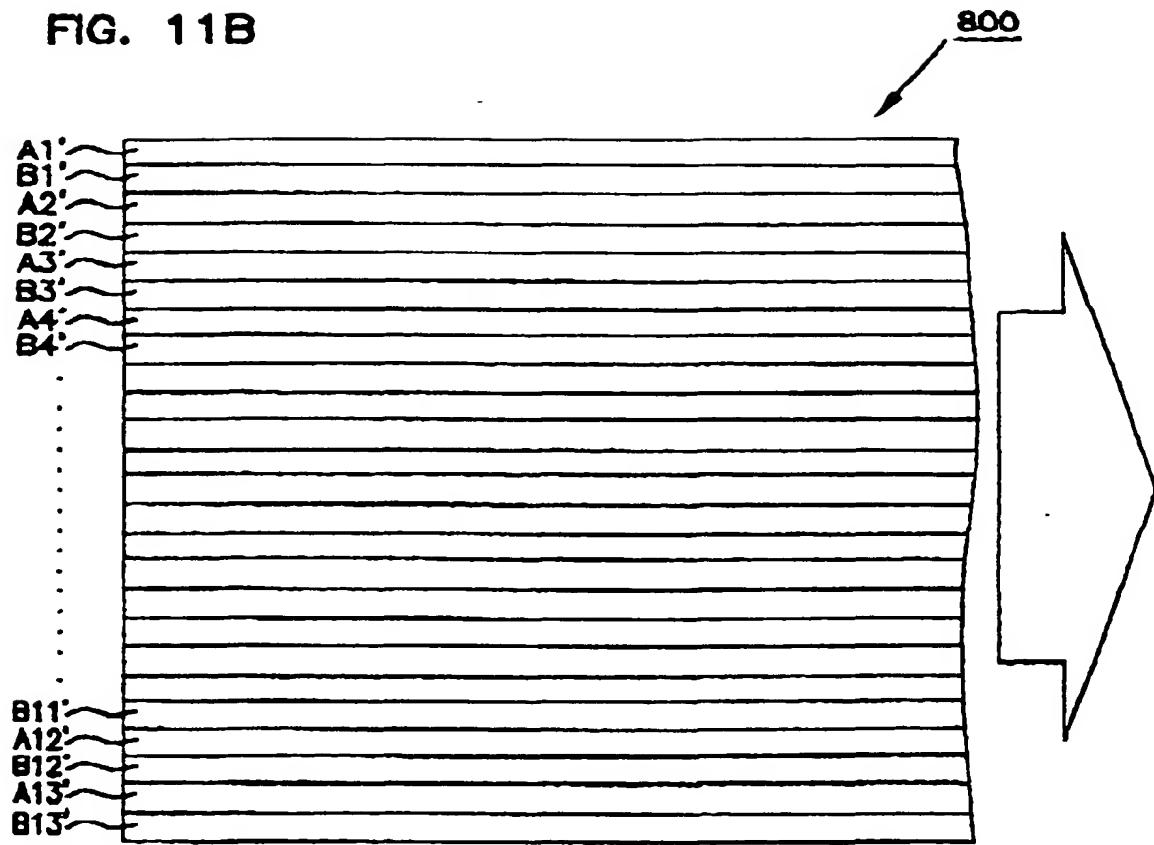


FIG. 12

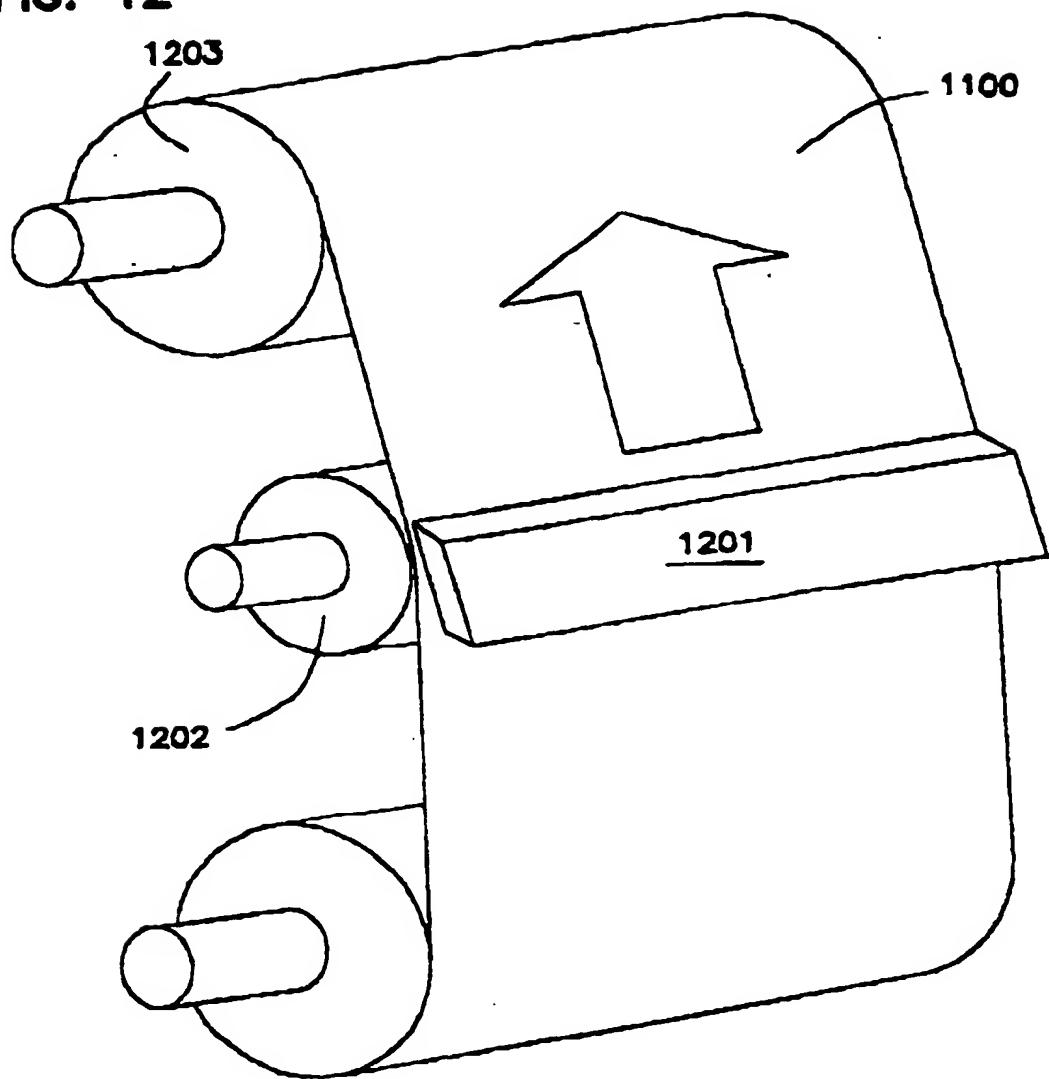


FIG. 13A

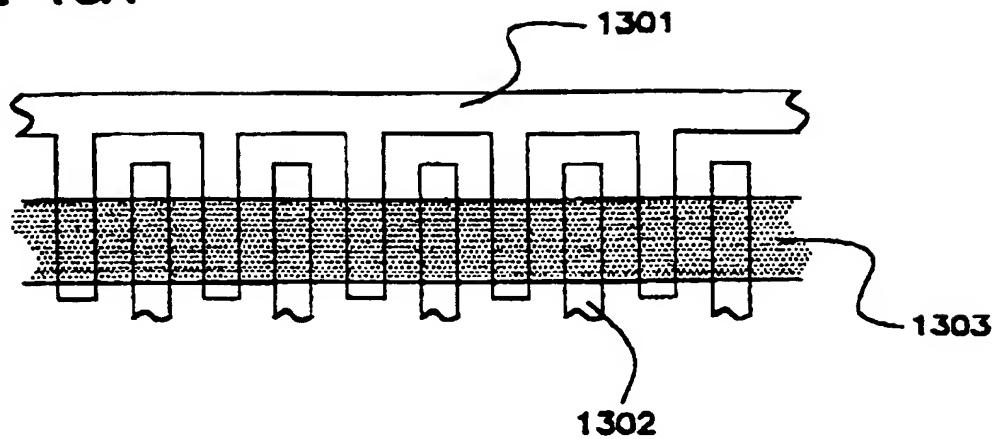


FIG. 13B

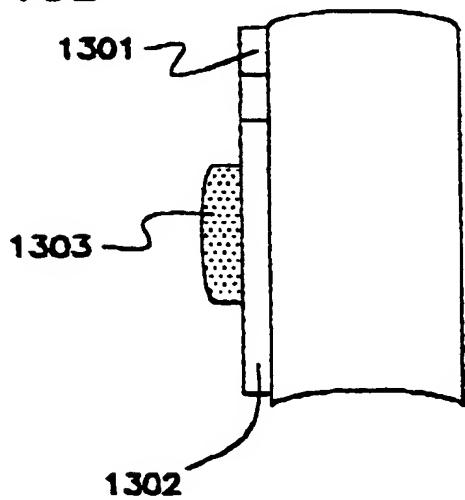


FIG. 14A

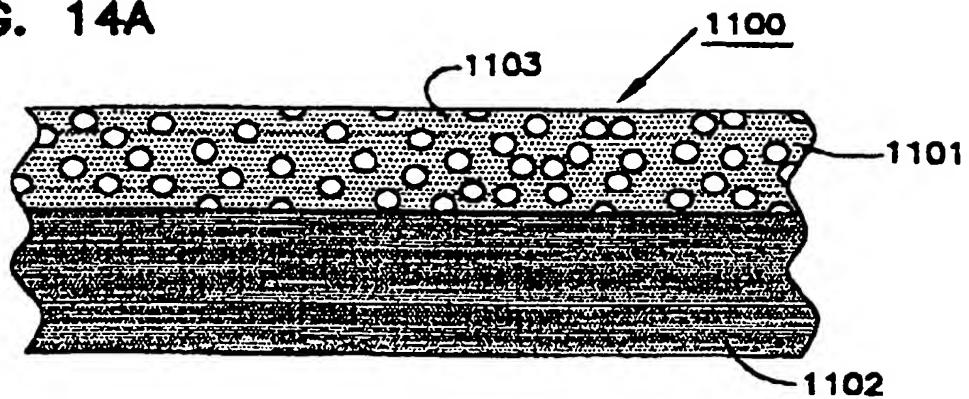


FIG. 14B

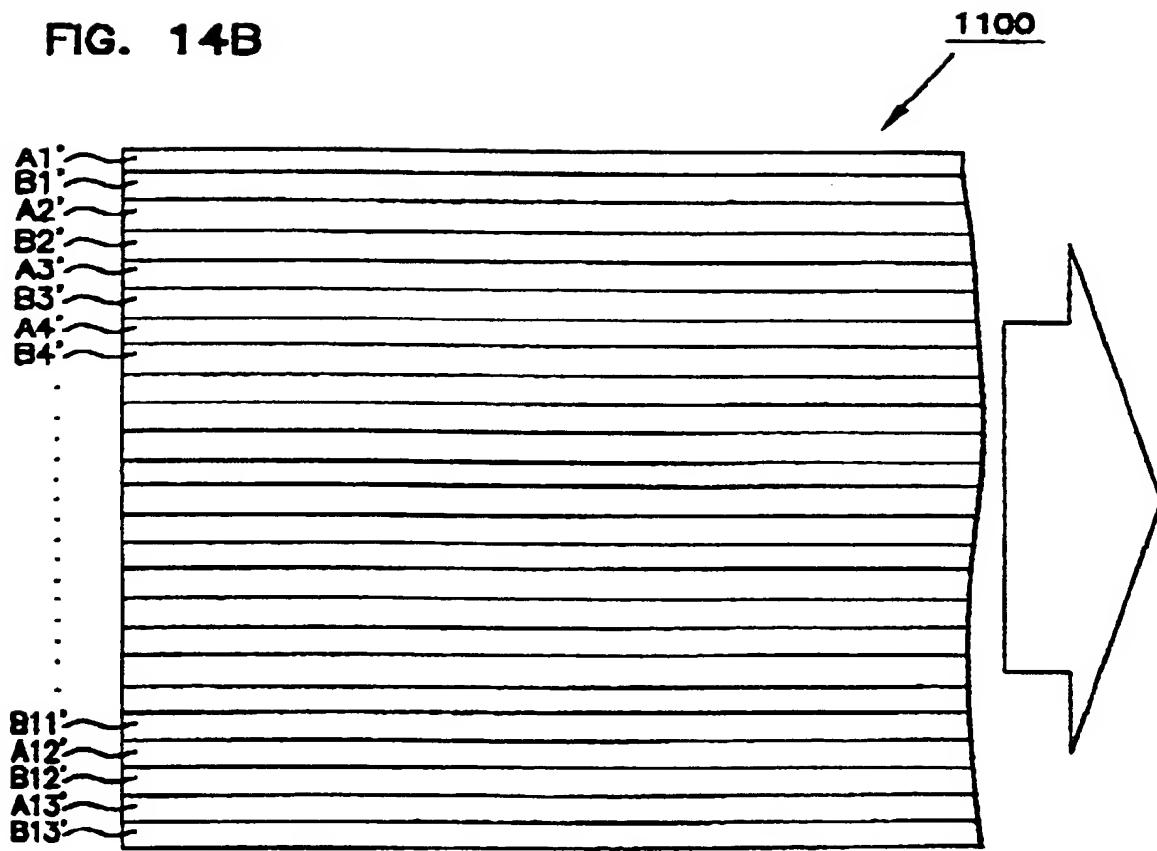


FIG. 15

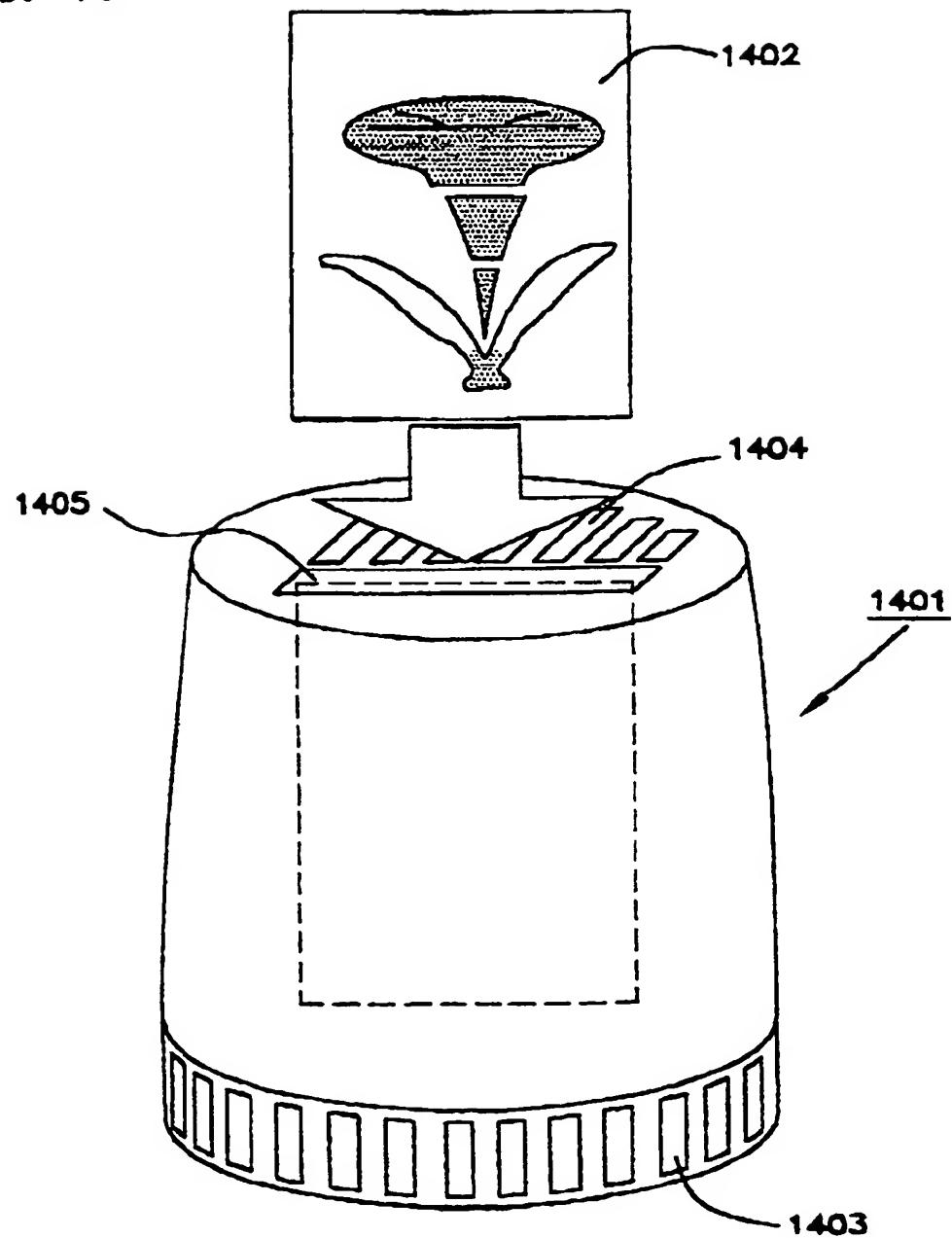


FIG. 16A

NUMBER	RELEASE DURATION			RELEASE UNIT	SENT
	1	2	3		
70% ~ OVER	~16°C	10	65	BWAM	
	16°C-25°C	30	A1	PRE	
	25°C	20	B1	LENT	
	~16°C	10	B6	WIND	
30% ~ 70%	16°C-25°C	30	A2	OK	
	25°C	60	-	NEGATIVE ION	
UNDER ~ 30%	~16°C	10	B7	PHAM	
	16°C-25°C	40	A5	BECH TEE	
	25°C	15	B2	ASME	

FIG. 16B

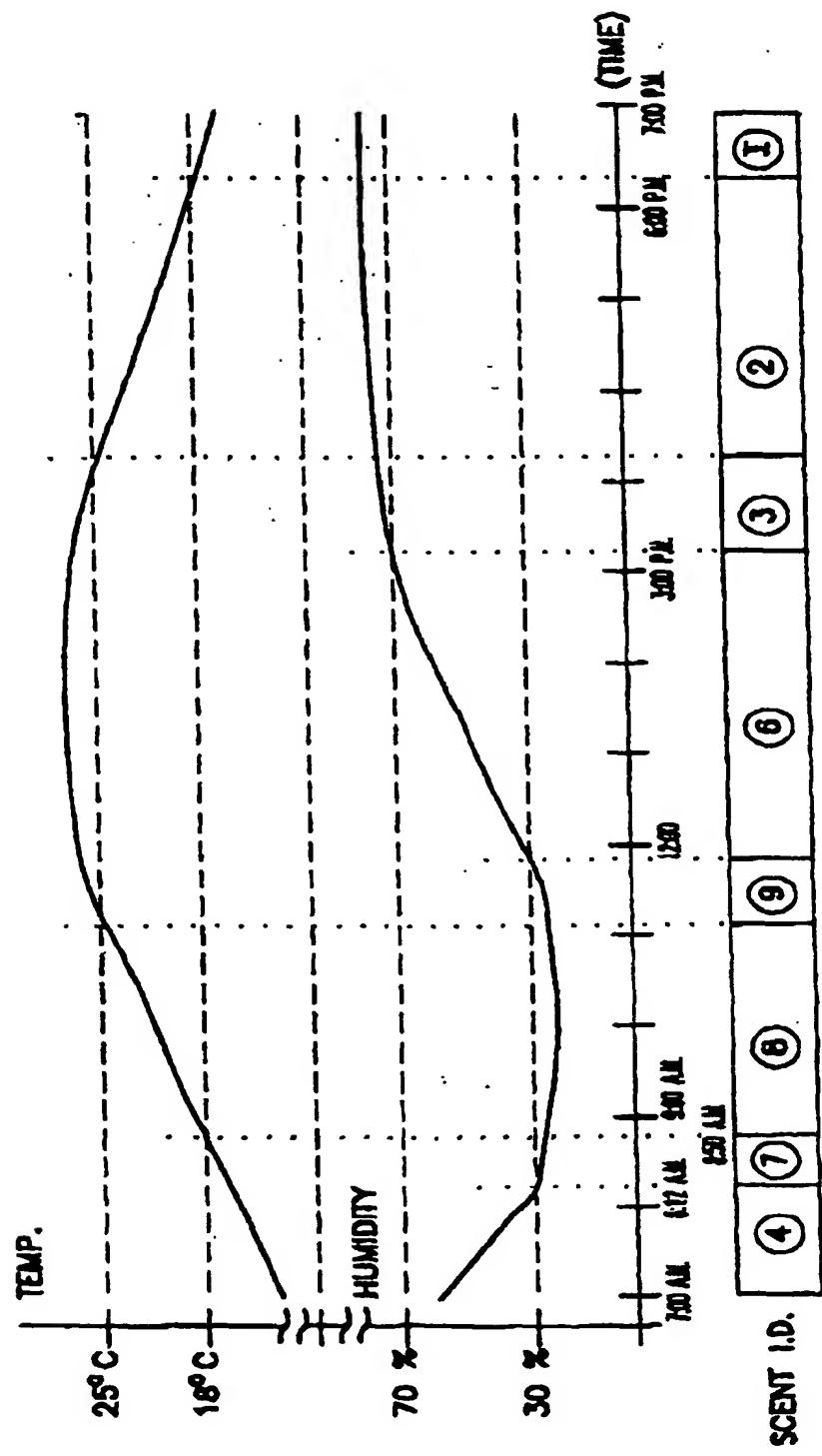


FIG. 16C

SQ	A STEP PROCESS	RELEASING UNIT #	RELEASING TIME	INTERNAL	RELEASING TIME
1	Negative Ion	-	180 sec.	-	180 sec.
2	A mugwort release	A6	120 sec.	50 sec.	20 sec.
3	A mugwort removal	B6	30 sec.	-	30 sec.
4	An int's release	A8	270 sec.	60 sec.	15 sec.
5	An int's removal	B8	30 sec.	-	30 sec.
6	A convolvulus release	B10	270 sec.	60 sec.	30 sec.
7	Negative Ion	-	180 sec.	-	180 sec.
8	A penilla release	A12	180 sec.	50 sec.	20 sec.
9	A penilla removal	B12	30 sec.	-	30 sec.
10	Wild chrysanthemum	A15	530 sec.	90 sec.	30 sec.
11	EOF	-	-	-	-

FIG. 17

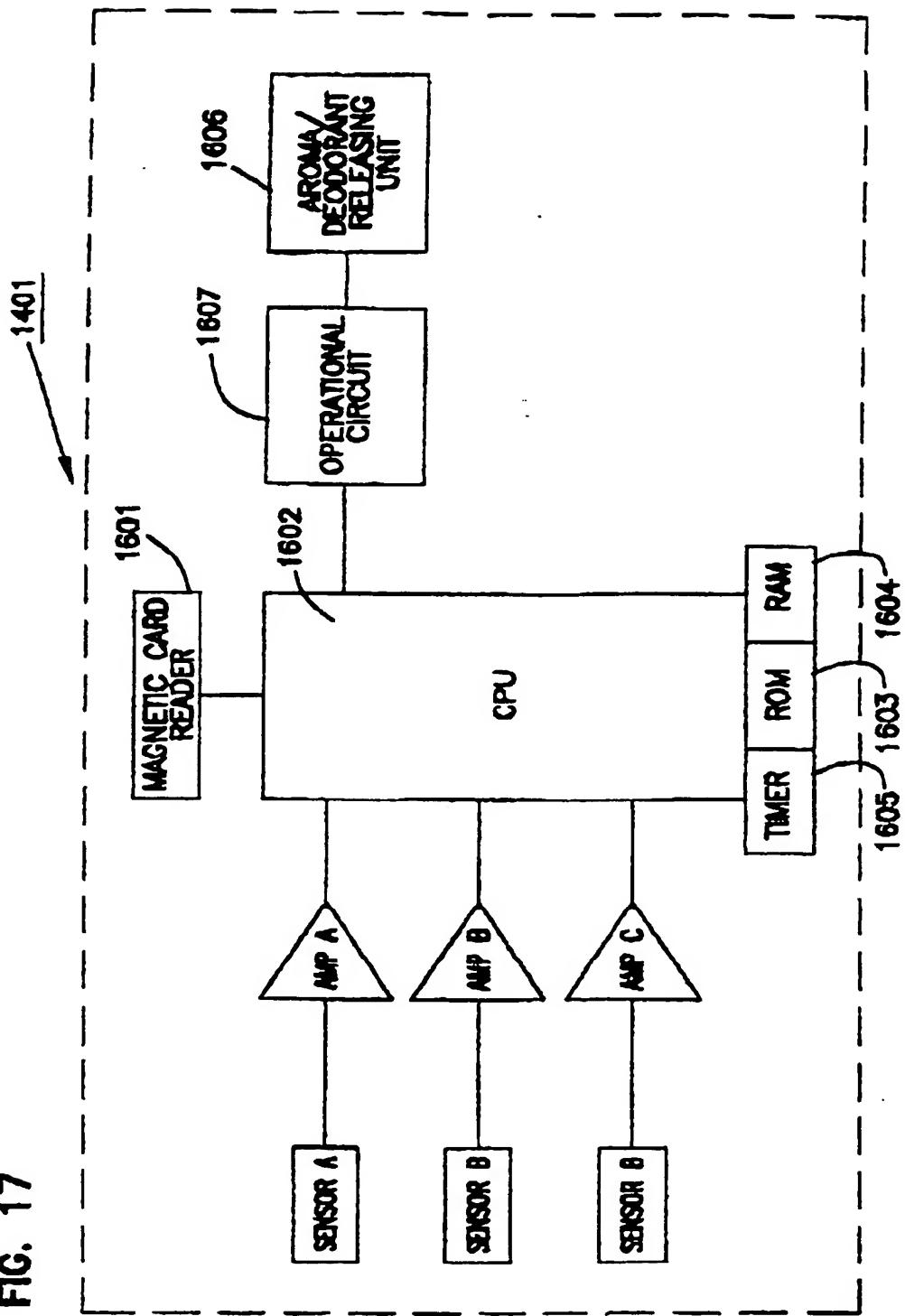


FIG. 18

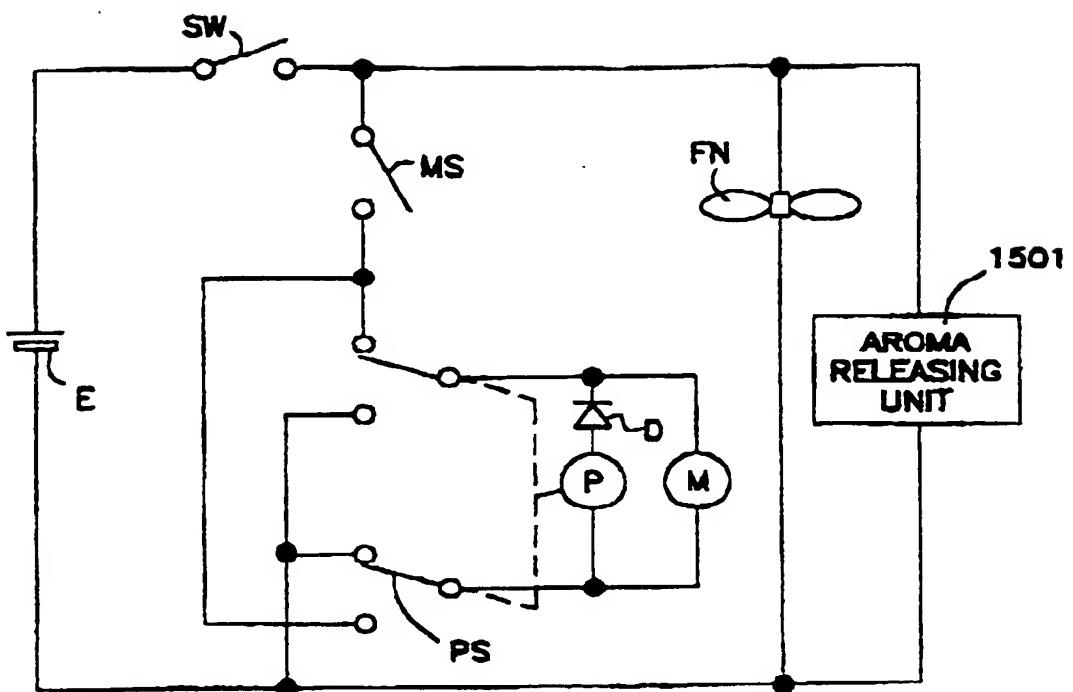


FIG. 19

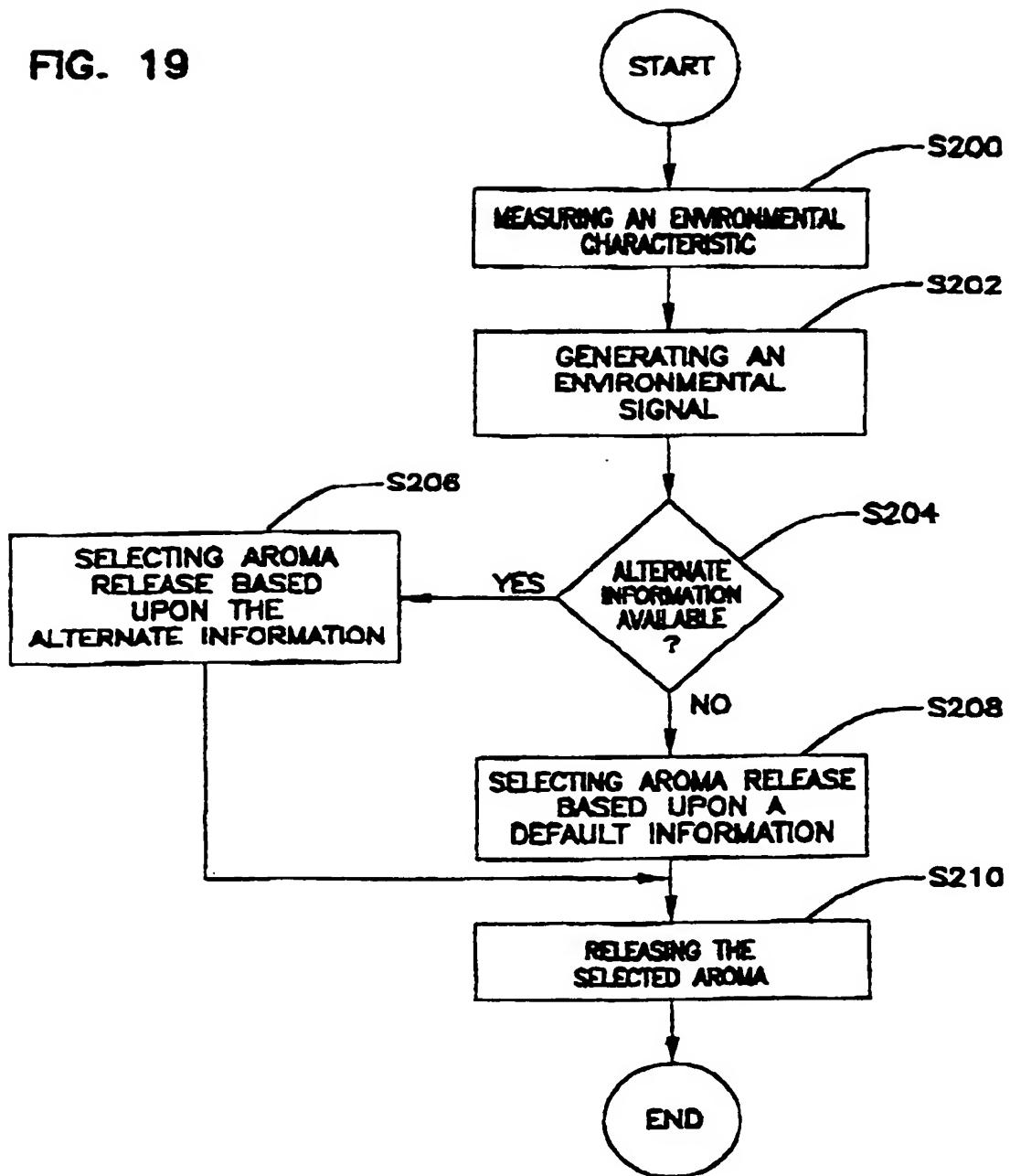
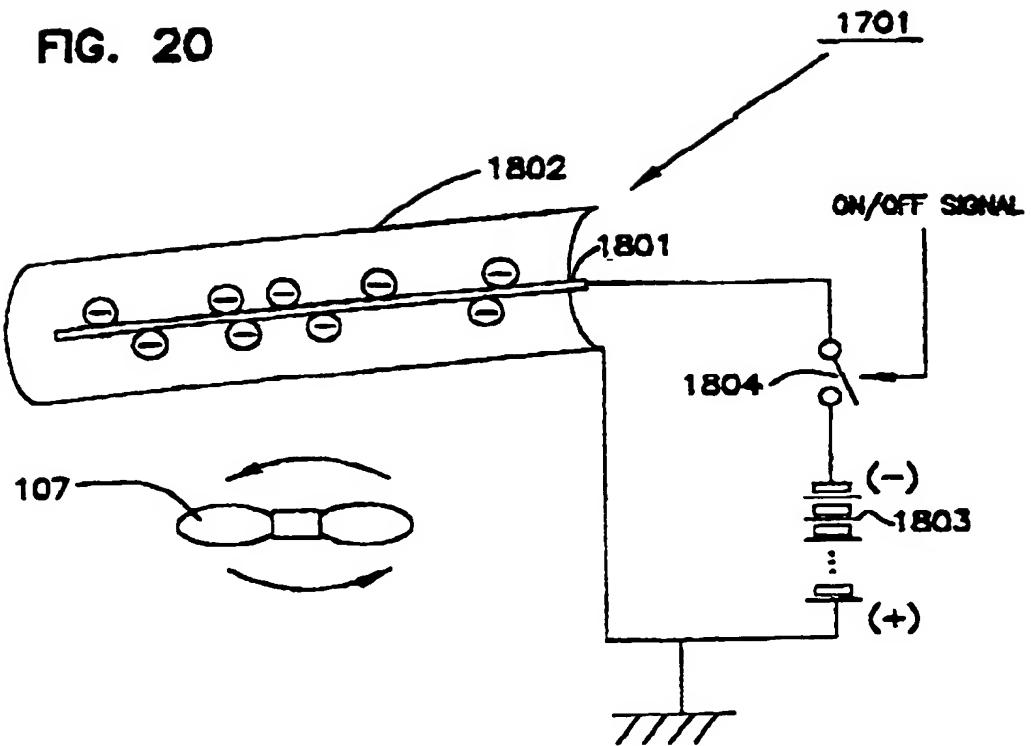


FIG. 20





European Patent  
Office

## EUROPEAN SEARCH REPORT

Application Number

EP 97 11 6171

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int.Cl.6)			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	G05D21/02 A63J23/02			
X	PATENT ABSTRACTS OF JAPAN vol. 017, no. 523 (C-1113), 21 September 1993 & JP 05 146499 A (NEC HOME ELECTRON LTD), 15 June 1993, * abstract *---	1-3, 5-11, 20-22, 25, 30-32,48	G05D21/02 A63J23/02			
X	PATENT ABSTRACTS OF JAPAN vol. 015, no. 285 (C-0851), 19 July 1991 & JP 03 099670 A (SHIMIZU CORP), 24 April 1991, * abstract *---	1,4,20, 23	1,4,20, 23			
A	PATENT ABSTRACTS OF JAPAN vol. 095, no. 001, 28 February 1995 & JP 06 292287 A (SONY CORP), 18 October 1994, * abstract *---	1,12,19, 20,26, 27,48	1,12,19, 20,26, 27,48			
A	DE 41 35 796 A (G. WITTEK) 6 May 1993 * abstract * * column 21, last line - column 22, line 68 * * column 23, line 27 - column 24, line 18; figures 1,11,15 *---	1,12,19, 20,26, 27,48	TECHNICAL FIELDS SEARCHED (Int.Cl.6) G05D A63J			
A	US 5 398 070 A (LEE DONG H) * abstract * * column 5, line 55 - column 8, line 32; figures 1,2,5 *---	1,8,9, 12,19, 20,26, 27,31,32	1,8,9, 12,19, 20,26, 27,31,32			
A	EP 0 398 687 A (WAKABAYASHI SHOTEN KK) * abstract *---	5	5			
The present search report has been drawn up for all claims						
Place of search	Date of completion of the search	Examiner				
MUNICH	19 December 1997	Helot, H				
CATEGORY OF CITED DOCUMENTS						
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document						
T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document						



## EUROPEAN SEARCH REPORT

Application Number  
EP 97 11 6171

DOCUMENTS CONSIDERED TO BE RELEVANT									
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)						
A	DE 40 18 020 A (SHIMIZU CONSTRUCTION CO LTD) * abstract * * column 2, line 52 - column 3, line 49; figure 1 * ---	6,30							
A	EP 0 616 175 A (YUSHIN ENGINEERING KK) 21 September 1994 * page 1, line 8 - line 13 * ---	37							
A	US 5 356 458 A (JAVADI YOUNES ET AL) * abstract * ---	38							
A	US 4 102 656 A (B. KORITZ) * abstract * ---	39							
A	WO 94 09493 A (G. TEBBE) 28 April 1994 -----	47							
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)						
<p>The present search report has been drawn up for all claims</p> <table border="1"> <tr> <td>Place of search</td> <td>Date of completion of the search</td> <td>Examiner</td> </tr> <tr> <td>MUNICH</td> <td>19 December 1997</td> <td>Helot, H</td> </tr> </table>				Place of search	Date of completion of the search	Examiner	MUNICH	19 December 1997	Helot, H
Place of search	Date of completion of the search	Examiner							
MUNICH	19 December 1997	Helot, H							
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... & : member of the same patent family, corresponding document							
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document									

